

Annual Report of University of Vermont Extension and the Vermont Agricultural Experiment Station

FY2001

A. Overview and Accomplishment Highlights

Faculty and staff at University of Vermont (UVM) Extension and Vermont Agricultural Experiment Station (VT-AES) focus on providing research and outreach programs that meet the needs of the state's citizens. Together these experienced and innovative professionals work to seamlessly integrate higher education academic, research and outreach services to protect and enhance a quality of life that is characterized by a thriving natural environment, a strong sense of community, and a deeply rooted connection to agriculture. As Vermonters begin the 21st century, they are presented with many opportunities, as well as challenges, that can be effectively addressed through the many resources available at the state's only land grant institution.

University of Vermont Extension's mission is to improve the quality of life for Vermonters by bringing the benefits of research and technology to them. University of Vermont Extension faculty and staff interact directly with many diverse audiences not just in program delivery, but also in learning about and addressing the problems and opportunities affecting Vermonters. More than 100 citizens serve in advisory capacities to ensure that educational programming is targeted and relevant to areas that are important to Vermonters. Working collaboratively with other departments of the University of Vermont, the Division of Extension strives to strengthen efforts to ensure that educational resources remain accessible and relevant to the state's citizens. For many Vermonters, Extension is a critical gateway to higher education serving as the initial or only contact many individuals have with Vermont's land grant institution. Extension faculty and staff logged over 47 Full Time Equivalents in outreach efforts during FY 2001 using a variety of approaches: the production of 938 publications and press releases; the development of 509 web page publications; 2,267 group presentations and workshops; 527 radio and television appearances; 5,529 on-site visits; 3,114 in-person office consultations; and 16,520 phone consultations. Additionally, 6,556 volunteers donated 43,235 hours in support of Extension outreach efforts.

The mission of the University of Vermont Agricultural Experiment Station is to conduct applied agricultural research to benefit the citizens of Vermont. This mission is fulfilled through our efforts to accomplish the following goals: 1) to ensure an adequate supply of food and fiber at a reasonable cost; 2) to enhance general health through improved nutrition; 3) to evaluate and improve environmental practices that may have an impact on the quality of life; 4) to promote the social and economic well-being of people; and 5) to guide the orderly development of communities and land use. Through collaboration, research and outreach faculty and staff contribute to programming success. Extension faculty and staff create critical linkages between on-campus and regionally based personnel and infrastructure.

Coordination between research and Extension personnel resulted in the development, identification, and successful commercial planting of two new apple cultivars – “Honeycrisp” and “Ginger Gold” --, now planted throughout the State of Vermont. “Honeycrisp” exhibits many desired attributes, including fruit quality, storability, and winter hardiness, which are very important to Vermont consumers. Future research and outreach efforts will focus on how these

cultivars will affect production, orchard profits, consumer demand, and over-wintering fruit quality for consumers. Additional outreach efforts are planned to improve growers' yield through the use of the most efficient rootstock, another research finding.

- **Improving Agricultural Sustainability and Protecting Natural Resources**

One outreach goal is to assist resource-based industries to maintain or improve their viability while developing environmentally sound management practices. To this end, Extension has been able to assist 10% of Vermont lumber manufacturing businesses through workshops developed and presented. The forest products industry ranks second in economic importance to Vermont, with approximately \$1.5 billion in shipments annually. Workshops designed to develop better hardwood log measurement and grading practices and lumber drying techniques produced immediate results for a variety of participating businesses. One business demonstrated how their changes in practices led to higher-quality logs entering the mill, providing a greater economic return from lumber processing. Log sawing cost per unit volume decreased while revenue increased. The mill became profitable instead of shutting down production and laying off employees. Two furniture-making businesses also showed positive outcomes from improved air-drying practices made after attending the workshops. The businesses increased lumber quality while reducing waste, netting an immediate 10% cost reduction. New customers increased an average of five percent, and repeat customers increased by ten percent within the year. Other outreach efforts, including information distribution and discussion groups on business and water quality management techniques led to more than 50% of 220 participating loggers adopting improved water quality protection practices into their businesses. Participants also reported average logging cost reductions of three percent, while simultaneously earning average revenue improvements of two percent.

As dairy herd sizes increase, water quality can decrease as a result of bacterial contamination and increased loads of organic nutrients entering from field runoff streams. After multistate research efforts elucidated cost-effective phosphorus management recommendations, dairy farmers were informed of the most cost-effective strategies to reduce phosphorus runoff into waterways.

Another outreach goal is to protect agricultural production from damaging pests, while developing environmentally sound management practices and high quality products. Mastitis is still the most costly disease to the Vermont dairy industry, costing \$32 million in production losses annually. University of Vermont Extension provided milking schools that included education about ways to prevent the development of mastitis, and to reduce the impacts of mastitis on dairy production. Of 55 participating dairy farm owners, representing four percent of all farms in Vermont, 88% reported making management changes after attending the milking schools. In addition, 44% of attendees reported lower incidences of mastitis and lowered somatic cell counts associated with the onset of mastitis. Although number of cows affected was not measured here, each cow contracting mastitis can be translated into a \$200 cost to the farm.

Integrated Pest Management programs have been carried out to assist Vermont greenhouse, maple-sugar, and vegetable growers. Attracting over 2,500 people during the year, workshops have led to 50% of greenhouse growers newly adopting IPM methods. Apple IPM programs, involving web-based, mail-based, phone-based and in-person contacts and workshops, show that 97% of participants reduced or minimized pesticide use through the use of IPM information gleaned from program activities.

Threats to Vermont agriculture also include invading species, such as the army worm, thrips, and the Asian long-horned beetle. Army worm infestations caused feed losses to 80% of dairy farms in several state counties. Outreach efforts led to more widespread use of containment practices, as farmers increased the rate at which they trimmed edges and ditches, thereby breaking the path of entry for the army worms, and reducing their impact on over-wintering feed stores. Research on thrips has been fruitful for maple syrup growers, who bring \$200 million per year to Vermonters in value-added sales receipts, farmgate sales of maple syrup, and tourists coming to Vermont to see fall maple foliage. Researchers discovered a major insect-killing fungus that reduces pear thrips populations, developed an inexpensive, “grower friendly” means of producing various strains of the entomopathogenic fungi for growers, and developed a rapid method of estimating overwintering populations of forest thrips. This information is now being disseminated to maple syrup growers in attempts to change management practices to reduce losses due to thrips populations. Another threat to maple trees is the Asian long-horned beetle, which has been observed in New York and Chicago. The only eradication method known for this invading insect is tree-burning. A major proactive campaign has been designed to improve the likelihood of early detection and eradication of the Asian long-horned beetle in New York and Vermont. Although awareness has increased, participant impacts on large-scale outbreaks of this insect pest have (fortunately) not yet been tested.

- **Improving Food Safety, Security, and Quality**

Food safety initiatives included human handling of food from the processing and manufacturing stages through the retail and consumer use stages. The first steps taken for the New England Good Agricultural Practices (GAP) project have provided focus for future activities. Survey results from 600 farms and 742 consumers surveyed indicate the need to address consumer doubt about produce safety to human health. The majority of survey respondents expressed limited confidence in produce safety, and believed that most contamination occurred in the growing, harvesting, and processing stages of production. They also expressed an overwhelming willingness to pay more for foods grown and processed by following Good Agricultural Practice guidelines. Farm surveys indicated a desire to gain competence in on-farm food safety, with particular emphases in areas including manure application, personal health and hygiene, use of sanitizers, Good Agricultural Practice standards and techniques, and microbial hazards. This critical first step provides the groundwork necessary to efficiently develop and implement effective educational programs for farmers and consumers regarding Good Agricultural Practices. It also provides data that can be used to develop more refined and appropriate measurement indicators for program success. Baseline soil samples from participating GAP farms were also obtained.

Child food safety concerns led to a multistate and multi-institutional project to design, publish, and implement a training program for school food service workers. Twenty-three Vermont food service workers have completed the nationally recognized certification program, and provide models for schools throughout Vermont.

- **Improving Human Health and Nutrition**

Programs have been designed to change human eating patterns and nutritional decisionmaking practices in order to improve human health and reduce the adverse effects of aging, diseases (e.g. diabetes), and low incomes. All programs implemented show levels of improved behavioral patterns, with participants showing improved skills at planning and preparing healthy and highly

palatable meals, higher confidence levels in preparing meals for others with health problems, and improved food resource management and food safety practices. Programs also showed increased key nutrient intakes for some target audiences improved. For example, seniors in the Making Nutrition Compute program showed increased mean nutrient intake for protein, iron, calcium, vitamin A, vitamin C, and vitamin B-6.

- **Encouraging Economic and Community Development**

A multi-institutional effort has yielded a large USDA award and the development of a useful Northeastern Center for Food Entrepreneurship. The Center has already had an impact on the success of many start-up and small business enterprises as a method of one-stop shopping for regulatory and marketing information, tools, techniques, and advice. The Women's Agricultural Network reported improved management strategies for 143 women this past year.

Communities in the Rural Economic Action Partnership (REAP) Zone in Vermont's Northeast Kingdom have received over \$13 million for community development and rural area improvement projects as a result of the University of Vermont Extension-coordinated Northeast Kingdom Collaborative's efforts. Over 100 municipal officers were trained in how to make the best use of their technology for communication purposes in the communities in which they serve. Fifty communities now have new websites available to community members and municipal officers and planners.

- **Advancing Youth Community Involvement**

Expanding the Caring community carried out educational programs designed to improve youth life and community development skills. Results to date show that 69% of 3,732 youth participants made at least one positive behavioral change in these areas of competency. Youth community involvement can be issue-oriented. An educational program funded by Extension, Sea Grant, and University of Vermont dollars increased youth awareness of watershed ecology, human impacts on watershed ecology, and ways they can help to improve watershed water quality. The well-controlled experiential learning opportunity enabled students in several communities to make public presentations of their findings in hopes of creating policy changes. One community decided to boil water for a period of time in response to data presented by students that showed high bacteria levels. Low-income youth participants in a gardening program not only learned how to begin and maintain a garden to supplement household food resources, but also engaged in helping others in need through the Plant A Row for the Hungry program. To this end, 125 pounds of food from extra rows planted by 341 participants was donated to food shelves and soup kitchens. Participants unanimously planned to continue growing gardens for their families and the needy, with many planning to add rows for others in need. Babysitter Safety Training programs certified 287 babysitters for families in northern Vermont counties, offering youths with a productive opportunity to gain income, and parents with more piece of mind when leaving their children in the hands of a babysitter.

- **Technology-based Outreach**

At an annual retreat in October 2000, our advisors discussed effective program delivery. They offered valuable advice on ways to use computer and other technology to reach more Vermonters and recommended that Extension personnel be mindful of the number of individuals who do not own or use computers. Therefore, University of Vermont Extension and the VT-AES use several

delivery methods--including the Across the Fence television show reaching more than 80,000 viewers each week day, brochures, fact sheets, e-mail distribution lists, farmer discussion groups, Web sites, workshops, meetings, radio and newspaper, and newsletters--to share research and educational programs. Citizen advisors conceived of the University of Vermont Extension and VT-AES newsletter, Impact, now in its seventh year of production. Impact is distributed quarterly to stakeholders.

Research and outreach integration have led to an innovative nutritional learning tool for the elderly at risk of nutritional deficiencies. By placing touch-screen computers with nutritional information in nursing homes and assisted care centers, University of Vermont Extension can help home-bound elderly make better nutritional decisions. Development of the product is now completed and pilot introductions are underway. Pilot research using laptops in homes of homebound seniors are encouraging, as participants show increased mean nutrient intake for protein, iron, calcium, vitamin A, vitamin C, and vitamin B-6.

- **Nondiscrimination Actions**

University of Vermont Extension programs contacted a total of 116,021 people during FY2001 programming. Of these contacts, 880 were African American, 425 were Asian, 665 were Latin American or Hispanic, and 894 were Native American. All other contacts were White. In FY 2001, 56% of contacts were male, and 44% were female. A total of 28,939 youths were contacted during Extension programming efforts during FY 2001.

Efforts equivalent to twenty-four days were used by Extension personnel to enhance the impact of nondiscrimination policies. Examples of effort included serving on Extension groups that take up issues related to civil rights and equal opportunity, reviewing information about University of Vermont's bias complaint policy, outlining and updating Extension's relationship and responsibilities regarding the Americans with Disabilities Act, reviewing attendance records at outreach events to determine whether additional efforts are needed to ensure disadvantaged groups can attend, informing faculty search committees of civil rights responsibilities associated with hiring, emphasizing inclusiveness in revisions of by-laws for the Northeast Kingdom Collaborative, recruiting a minority leader to speak at a meeting, and attending diversity-oriented workshops and events.

Federal law (7CFR15) expressly prohibits discrimination in cooperative Extension agricultural programs. "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any program or activity...". The regulations state the following prohibitions: "discrimination in making available instructions, demonstrations, information, and publications offered; discrimination in the use of any program or activity including offices, training facilities, lecture halls, or other structures or improvements; or discrimination in training activities, admission to or participation in fairs, competitions, field days, and encampments conducted or sponsored by, or in which the Cooperative Extension Service participates."

USDA requires Extension to use an equal opportunity statement on all print material (including--but not limited to--conference brochures, letterheads, and publications): "University of Vermont Extension, and U.S. Department of Agriculture, cooperating, offer education and employment to everyone without regard to race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or familial status."

FY 2001 Highlights of University of Vermont Extension Outreach and Vermont Agricultural Experiment Station Research

National Goal Area 1: An agricultural system that is highly competitive in the global economy.

Vermont agriculture has entered a very dynamic stage. Change within the agricultural sector creates opportunities for Extension to improve the competitiveness in domestic production, processing and marketing of agricultural products by Vermont's farmers. The traditional mainstay, dairy, has undergone many changes as producers strive to compete in national and potentially global markets. Vermont agriculture is strongly dependent on the profitability of its dairy industry, which represents 85% of all agricultural commodity receipts. However, data shows that the number of dairy farms has steadily declined over the past decade from a total of 2,174 operations to the current 1,348 operations. Many farms have increased herd sizes in attempts to realize economies of scale, while others have simply gone out of business. The number of cows producing milk has also declined from 162,000 to approximately 152,000, although milk production remains relatively stable. To remain viable in the competitive dairy industry, farms must improve production efficiency, produce high quality milk products, and offer a variety of profitable value-added products from milk products and by-products. Farmers also need to be well informed and educated about pricing and market indices and practices affecting their profits.

University of Vermont Extension and Agricultural Experiment Station efforts have focused on these priorities. University of Vermont Extension and Research personnel have worked to reduce the adverse effects of mastitis, the most costly disease affecting Vermont dairy farmers, in the dairy farming industry. Information gleaned from research on the effects of milk quality due to mastitis has been effectively transferred to 55 dairy farms through an educational milking school program. Forty-four percent of milking school participants reported lower incidences of mastitis and somatic cell counts associated with mastitis. Dairy farmer discussion groups meet on a monthly basis to discuss a variety of topics. Surveys show that farmers find these discussion groups to be the most effective means of obtaining valuable information that they can translate to their businesses. University of Vermont Extension's support of the Vermont Farm Labor Services organization, a nonprofit cooperative designed to oversee the management of temporary labor service for farms, has helped to increase participation and has begun to implement bylaws. University of Vermont Extension personnel also responded to serious armyworm infestations threatening eighty percent of the dairy farms in two counties. Actions taken by farmers as a result of meetings organized by Extension personnel reduced the negative impacts of these infestations on crop reductions and winter feed for dairy cows.

With less farmland devoted to dairy production, new agricultural enterprises have emerged. Vermont's agriculture has become increasingly diversified supporting a wide variety of ornamental, fruit, vegetable, and livestock production systems. Farmers have also become entrepreneurs, learning how to add value to their products and how to sell directly to consumers. Change often stretches the knowledge base of farmers and agribusiness managers, and they rely heavily upon Extension to provide sound, science-based information about the production and marketing of new commodities. Furthermore, in this environment Extension can become an active agent of change by identifying and evaluating new opportunities for farmers and agricultural entrepreneurs.

A research project by University of Vermont Agricultural Experiment Station has developed a whey protein-based wood-finish product that is inexpensive to produce, and that represents a safe and healthy alternative to currently available commercial wood finish products containing high levels of volatile organic compounds. This product tested at least three times more resistant to scratching than five leading commercial brands, while still exhibiting similar or better drying times and thinness characteristics. The product contains only seven percent volatile organic compounds, representing a 75% reduction over commercial brands.

University of Vermont research has also identified two new apple cultivars commercially appropriate for this region's growing and soil conditions. Outreach efforts have led to the establishment of these cultivars in commercial orchards throughout the State of Vermont. Apple tree yield efficiency has been the target of research comparing rootstocks, and a high yield efficiency rootstock series has been identified for Vermont apple growers as a result of this research.

Maple syrup production and processing research has yielded important information for growers. A Polymerase Chain Reaction (PCR) technique has been developed to make earlier determinations about which trees have high sugar yields, which will translate to higher per-tree profitability for maple syrup producers. A rapid technique for estimating thrips populations in sugar maple stands will also assist growers in reacting more quickly, and in anticipating subsequent damage. Studies of the use of entomopathogenic fungi as a biological control of thrips populations in maple trees have shown that the fungi can be cheaply produced by growers, and their use will reduce the farmers' dependence and expense on pesticides, while simultaneously reducing the environmental stresses associated with pesticide applications.

Workshops with loggers have served to reduce costs for participating operations by three percent, and to improve average revenues by two percent. Other workshops have helped to improve log quality as it enters processing mills by improving drying techniques. Several participating operations reported that the improvements associated with the programs to their businesses have allowed them to expand their operations, while others were able to remain in business when they would have otherwise closed their operations.

Technological outreach has included the development of several websites for commercial and home gardeners, apple growers, horticulturalists, and animal production farmers. Many publications are distributed to target audiences, including a dairy-oriented fact sheet series, several newsletters for apple, vegetable and berry growers, fliers informing a variety of groups in the public sector about the threat of Asian longhorned beetle infestation, IPM newsletters, and price indices for loggers and farmers. University of Vermont's Master Gardener Program involved the training of 221 interns at 12 Vermont Interactive Television (distance-learning) sites, and 811 interns volunteered more than 8,000 hours to assist gardeners in answering questions. A toll free Helpline answered 2,800 gardener questions. As a result of these efforts, Vermont farmers and home gardeners are employing more environmentally low-impact pest management practices that promote strong plant growth coupled with a decreased use of chemicals, providing them with healthier crops, soils, and waterways.

University of Vermont Extension supports a healthy and diverse agriculture linked to healthy communities that coexist with a scenic and pristine natural environment. The following

document describes the activities of University of Vermont agricultural faculty and staff as they strive to address the needs of farmers and citizens of Vermont.

Key Theme: Agricultural Competitiveness

Entomopathogenic fungi of pear thrips as microbial control agents – Thrips damage can seriously impact the economics of the agricultural community in Vermont. Sugar maple is important. Agribusiness and value-added maple products bring in \$100 million per year to Vermonters. In addition \$12 million is earned annually from farmgate sales of maple syrup. To this can be added about \$100 million received from tourists coming to Vermont to view fall foliage. Western flower thrips damage to greenhouse ornamentals in the U.S totals many millions of dollars annually. This results from direct damage to the plants and the vectoring of viral diseases. Alternatives to the use of insecticides for their control in maple forests, greenhouses and vegetable crops are needed because of insect resistance, environmental impacts and public and grower demands. VT-AES and University of Vermont Extension are addressing these needs by developing entomopathogenic fungi as one component of an IPM approach.

Using a recently developed computerized system for controlling and recording spray parameters, researchers completed replicated trials on the application of fungal spores to ornamentals using 12 different spray nozzles and 6 different variables. In addition, an extensive pilot test, using formulated entomopathogenic fungi, was done in two sugarbushes having high populations of pear thrips. Soil samples were taken periodically post-application to determine thrips infection rates and the persistence of the formulated material. University of Vermont initiated a statewide thrips survey in more than 100 sugarbushes, held four major scientific conferences on thrips, held the first international conference on thrips biology, ecology and management, and published a book of proceedings on thrips biology, ecology and management in cooperation with NATO. As a result of this research, a major insect-killing fungus associated with pear thrips was discovered. Although the fungus was originally identified as *Verticillium lecanii*, it was determined cooperatively that it should be classified as *Mariannaea* sp. Research has led to the development of a simple, rapid method of estimating overwintering populations of thrips in forests (for grower use); a rapid simple technique for examining and identifying fungi from the surface of thrips.; a computerized system for controlling and recording parameters for use experimentally in the application of fungal spores in a greenhouse (this system will be used to determine how to apply fungal materials in a greenhouse to a variety of different crops with different sprayers for thrips management); and a "grower friendly" method to mass produce various strains of entomopathogenic fungi (the base mediums used included maple leaves and millet).

Impact:

Information on the biology and ecology of thrips has been transferred directly to sugarmakers throughout the U.S through workshops and conferences conducted. The development of a rapid technique for determining thrips populations in sugar maple stands will assist growers in anticipating subsequent damage. Information on the use of entomopathogenic fungi can be used by growers to reduce pesticide use in controlling thrips populations, thereby saving money and reducing environmental stresses caused by pesticide use. Use of the "grower friendly" method of producing the entomopathogenic fungi should also represent a savings for growers.

This project was partially funded by Hatch Act Funds for the State of Vermont.

Develop a relative index of cold hardiness for select new apple cultivars in Vermont – The apple industry must identify and evaluate promising new cultivars with high fruit quality and climatic adaptability to remain globally competitive. The selection of cultivars and rootstocks that are adapted to our climate and pest conditions as well as produce high quality fruit that will compete successfully in the market place is a crucial decision for apple growers since the cost to establish or replant each acre of apples is estimated to be \$17,000. The ability of new cultivars to withstand extremely low temperatures in the winter and widely fluctuating temperatures in the spring and fall is important to survival in Vermont, and this cold hardiness needs to be documented before growers plant any trees.

University of Vermont has been carrying out two multidisciplinary projects in order to evaluate the horticultural qualities of new apple cultivars relative to Vermont orchards, develop a relative index of cold hardiness for selected new apple cultivars, determine potential pest problems associated with new apple cultivars, and develop a successful Integrated Pest Management approach for new cultivars that is suitable to Vermont conditions. The first set of plantings associated with these projects, in 1995, yielded four cultivars showing high yield efficiencies and good fruit quality. Three of these also have sufficient winter hardiness characteristics. Rootstock evaluations for the new cultivars showed that the CG dwarf and semi-dwarf rootstocks continue to show higher yield efficiencies than M series rootstocks. Research on IPM programs for the new cultivars showed that under an IPM program including a delayed first-spray strategy for apple scab, no fungicides for powdery mildew, and no application of any fungicide during July and August, five fungicide applications were sufficient in managing apple scab on certain cultivars, even during a wet growing season.

Impact:

Two new apple cultivars – “Honeycrisp” and “Ginger Gold” -- are now planted commercially throughout the State of Vermont. “Honeycrisp” is a new apple cultivar showing many positive attributes such as fruit quality, storability and winter hardiness. NY-75414-1, a scab resistant cultivar, also rated very highly in evaluations. When this cultivar is named, it will give growers another option in scab resistant cultivars. Tree yield efficiency can be improved for apple growers by planting GC dwarf series rootstocks, also learned from this research. An IPM strategy effective in wet growing seasons may be available, although further testing of the approach is taking place this year.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Plant Genomics

Invasive species research and education – Invasive species are altering landscapes around the world. Reed canary grass, *Phalaris arundacea*, is an aggressive invader of wetlands and pastures, displacing native species after establishment. The purpose of this research is to determine which genotypes of reed canary grass show the highest survivorship under different environmental conditions to determine conditions under which the grass is invasive.

Impact:

Results indicate that genotypes vary in their competitive ability. Farmers will use this information to decide which genotypes can be planted for forage without risk of aggressive invasion.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Genetic markers for sap sweetness in sugar maples – Maple syrup production costs are, in part, dependent on fuel costs. Increasing fuel costs reinforce the importance of finding sweeter maple trees. University of Vermont scientists are using a Polymerase Chain Reaction (PCR) technique to identify sweeter trees within a few years of planting, rather than waiting until the trees are mature to find those with high sugar levels. Methods for consistent PCR profiles with DNA from maple trees have been developed. These methods are being used to search for a characteristic PCR pattern that correlates well with high sugar production.

Impact:

Earlier identification of high-sugar maple trees will increase the per-tree profitability of maple syrup growers.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Agricultural Profitability

Control of quality in processing Vermont wood products – Vermont has about 900 loggers and 250 sawmills involved in processing wood products with an estimated value of shipments of about \$1.5 billion in 2000. Demand and competition for wood raw material is intense. Much of this raw material takes the roundwood form of a "log". Log quality and the ability to recognize and take account of natural quality and defect characteristics is critical to optimum effectiveness in wood processing.

Vermont has about 250 lumber manufacturers and about about 500 wood products manufacturers using lumber as a raw material input. The need to maintain acceptable quality standards of lumber is a critical requirement to sustainable product manufacturing and marketing. Protection of lumber against stain, decay, warp, splitting and checking is critical to prevention against quality and value loss and possible loss of markets-which could lead to business failure and loss of employment.

An all-day workshop on "Hardwood Log Measurement and Grading" was taught to 25 wood industry employees in August, 2001. Class participants were professional loggers, timber truckers, log purchasers, and sawmill employees. Participants learned how to recognize natural defects occurring in hardwood trees and logs cut from them. They learned how these defects can reduce the quality of wood products processed. Students learned how to grade and measure logs to optimize quality and economic value.

A two-day, 16-hour Extension workshop was taught on the "Basics of Lumber Drying Technology". Participants included custom furniture makers, secondary school vocational/technical teachers, sawmill owners and managers, sawmill technical employees and owners of small, specialty wood products business.

Impact:

In one example, participants in the class returned to work and implemented the hardwood log quality evaluation methods learned in the class. The results were immediate. Logs coming into the mill were of higher quality and provided a more economic return from sawing into lumber. Log sawing cost per unit volume decreased while revenue increased. The mill experienced an increase in lumber grade yield and an increase in lumber volume recovery from production. Consequently the mill became profitable and instead of shutting down production and laying off

employees, it has continued production and employment on an improved basis. The volume of logs supplied to the mill has also increased, enabling management to operate on a more stable planning basis.

Two furniture makers adopted several improved lumber drying methods learned in the course to improve the quality of their furniture and reduce processing scrap and wood waste. Both operations adopted methods of lumber drying quality control to develop improved gluing and finishing. Both adopted improved air-drying yard and dry kiln practices that reduced waste and improved lumber quality. As a result, furniture sales increased by approximately twenty percent. The number of new customers increased by five percent, and the number of repeat customers increased by ten percent. A ten percent cost reduction was achieved via decreased wood waste as a result of new knowledge obtained in this course. As a result, the survival of both small wood products businesses has been strengthened, allowing employment and cash flow to be maintained.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Gathering and publishing stumpage prices in Vermont – About 6,000 woodland owners in Vermont sell timber each year, and as many as 200 stumpage buyers reside in Vermont. These buyers and sellers need price information to help make decisions to maintain the profitability of their enterprises. Each quarter stumpage prices are compiled and reported to over 100 forestry consultants, timber buyers and county foresters through publication in *Northern Woodlands Magazine*. Vermont has been gathering stumpage price data since 1981, making it the state with the longest running, quarterly price reporting system in the country.

Impact:

Stumpage information has allowed many woodland owners and managers to negotiate fair contracts with buyers.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Economic analysis of wholesale versus market-diversified apple farms in Vermont – The apple industry is the leading fruit industry in Vermont, yet growers are suffering from low profitability over time. This project examines the current and projected financial situation for wholesale and retail orchards. Results indicate that the retail orchard has higher per-acre profitability than the wholesale orchard. The retail orchard also faces less financial risk in apple production. The wholesale orchard can generate more total income, total assets, and real net worth. A ten percent increase in prices has a larger impact on the profitability of both wholesale and retail orchards than a ten percent decrease in costs does.

Impact:

This information will help growers to better understand their own financial records, as well as the impact these financial variables have on their profitability.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Income Tax School – Business, financial analysis, income tax schools provide opportunities for farm-related businesses to gain expertise and apply useful information to improve market competitiveness. During the year, 1526 individuals participated in Agricultural Business

Management workshops and conferences. The Income Tax School registered 360 CPA's, tax practitioners, and others involved with tax issues.

Impact:

Programs have led to individual and general successes. The income tax school has decreased the average amount of time spent per tax return for tax-preparers. One struggling farm was assisted by developing a task analysis of farm and household, an analysis of transferable skills, a retirement assessment, and farm planning document after a working partner, the family's son, had died. The farm has not shown a profit yet, but does work as an economic unit. Another family was able to reduce the average age of first calving for forty heifers down to 26 months from 29 months in just over two years. This translates into a profit of approximately \$8,000 per year. Installations recommended to improve the efficiency of grain bins saved a farmer \$12,000 per year in lost profits. A farm considering a move to organic status was assisted through a customized analysis of the economic impacts of having an organic versus a traditional operation. The information and financial confidence gained during the analysis period helped the farmer make the decision to make the change, which begins this summer. Review of reproduction records for a dairy farmer goals were established with the help of University of Vermont Extension personnel. Results of efforts and record keeping led to a known reduction in average open days, services per pregnancy, and days to first service, and an increase in pregnancy rates.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Adding Value to New and Old Agricultural Products

Whey-based wood finish products – United States agricultural processing operations produce approximately 74 billion pounds of whey by-products, only half of which are utilized. Unused stocks of whey, especially those generated by small cheesemakers, are dumped on fields and run off into waterways, where released whey proteins and lactose lead to reduced levels of available dissolved oxygen in lakes and streams. Meanwhile, commercial wood finish products are predominantly chemical solvent-based. Although these products give desirable quality, their volatile organic compounds are detrimental to the environment and harmful to human health. A research project developed an environmentally friendly, inexpensive wood finish coating system using cheese whey as a primary binding material. Twelve formulations have been developed by using various ratios of components and by testing different cross-linking mechanisms on the performance of whey protein-based wood varnish products. Comparative tests and coating trials between one formulation and five commercial brands has shown the whey-based wood finish to be three times more resistant to scratching than commercial brands, while having similar or better drying times and thinness characteristics. Water resistance also appears to be similar or better than all commercial brands compared, although testing on mechanical and water resistant properties continues. At the same time, the whey-based wood finish product uses only seven percent volatile organic compounds, marking a 75% reduction in these harmful compounds over commercial brands.

Impact:

The success of whey protein-based films depends upon novel application concepts, relevant properties, and production-to-market costs. This project demonstrates that whey protein-based products may play an important future role in the commercial wood-finish products industry as an inexpensive, safe, and healthy alternative to currently available commercial wood finish products used on furniture and toys, and may offer another opportunity for dairy farmers and cheese producers to develop value-added markets to their farming operations. The wood finishes

will fit right into Vermont's clean-and-green image, thereby helping to sell Vermont wood products. Mingrui Guo, the principal investigator, says, "They'll be one-hundred percent natural and safe to everyone: safe to the environment, the workers, the house, the kids, and the pets. They can also be used to stain wood containers for food use."

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Managing Change in Agriculture

Processing character marked hardwoods from low quality trees – Vermont has about 950 independent logging and timber trucking small businesses. These small businesses form a critical component to the Vermont forest products industry. With about \$1.5 Billion worth of shipments in 1999, the forest products industry ranked second in economic importance to the state. Consumer demand for pulpwood, firewood, sawlogs, veneer logs, pallet logs, railroad tie logs, poles, posts, whole-tree chips and local construction logs was at an all-time high in 1999. Conventional wood processing is oriented toward clear wood. Wood with sound defects or character has the potential to be more extensively incorporated into high value wood products while offering more sustainable forest management options for Vermont landowners. Logging operations are under increased scrutiny to reduce negative impacts their operations have on land and water resources, including calls for reduced erosion and siltation. Logging operations are attempting to compete in the global market under these increasing pressures.

Discussion groups, workshops, presentations and information distribution focused on teaching improved techniques of business management, logging and trucking operating effectiveness, safety practices, and water quality management on harvesting sites. Guidance has been provided to assist loggers and truckers to avail themselves of education and training provided by several organizations in order to become professionally certified.

Impact:

Among the 220 loggers participating in programs, 40% exhibited increased knowledge of effective business and operations management practices. At least ten percent reported adopting a new technique or skill such as cash flow management and/or improved analysis of operating costs. More than 50% of participants reported adopting improved water quality protection techniques on their logging jobs. Participants reported average logging cost reductions of three percent and average revenue improvement of two percent. This represents a cost savings and increased profit margin for logging operations, and a decrease in practices causing a negative impact on the environment. Two program participants, one a forest landowner and one a logger improved their business and production management skills, enabling them to expand the scope of their forest product processing and marketing. Both purchased portable sawmills and a dry kiln to vertically integrate into lumber manufacturing and drying. This allowed them to reach new markets with higher value products. Wood craftspersons purchased kiln dried hardwood lumber and wood components for their craft products. Local builders purchased softwood dimension lumber for affordable housing. Both began to process and market "character wood" exhibiting natural wood characteristics. This allowed economic harvesting of low quality timber and improved sustainable forest management on woodlots involved.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Animal Production Efficiency

Milking Schools – Mastitis is still the most costly disease affecting the Vermont dairy industry, costing \$32 million in losses annually to Vermont dairy farms. Milk quality decreases and mastitis is indicated when somatic cell counts exceed 200,000. There is a demand for education on milk quality, and for skilled milkers able to make important distinctions in milk quality and identify mastitis cases through SCC analyses, in order to save time and effort, in the workforce. University of Vermont Extension provided milking schools as a means to educate farmers about milking methods and farm management practices to improve farm production efficiency. A total of 55 dairy farm owners and employees attended five milking school sessions offered around the State of Vermont.

Impact:

In a post-evaluation telephone survey, 88% of those who attended a milking school made a management change at the farm as a direct result of the milking school. Forty-four percent reported lower incidences of mastitis and lowered somatic cell count. Participants also reported reduced milking times. Each of these changes represents an increase in dollars per effort on Vermont dairy farms.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Precision Agriculture

Improved propagation and culture of ericaceous plants for Vermont landscapes – The final study conducted during the three-year project was to investigate the presence of ericoid mycorrhizal fungi (beneficial fungi) in select peat and peat-based products. *Vaccinium corymbosum* (highbush blueberry) was used as a host in this study. The data indicate that all peat and peat-based products contain natural populations of ericoid mycorrhizae capable of colonizing the roots of highbush blueberry.

Impact:

This study provided evidence that ericaceous plants grown in a peat-based substrate will become naturally colonized by existing ericoid mycorrhizae and therefore may not need to be artificially inoculated. This information can save growers and propagators of ericaceous plants such as rhododendrons, azaleas, and blueberries crop-associated costs.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Integrated Pest Management

Integrated Pest Management – Over the past five years, the Integrated Pest Management program has assisted Vermont greenhouse, maple-sugar, and vegetable growing costs and increased the rate at which environmentally sound agricultural practices are employed in greenhouse businesses.

Impact:

Approximately 400 people attended Greenhouse IPM workshops at University of Vermont, and approximately 50% of surveyed participants state that they have used IPM methods learned in the workshops. Nearly 2,000 people participated in annual sugarmaking meetings in different counties around the state, and approximately 200 vegetable growers have attended IPM workshops. The IPM program has disseminated information to thousands of Vermonters through public awareness programs on important insect pests, increasing the likelihood that early detection and eradication of potentially devastating insect pests will occur.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Risk Management

Vermont armyworm crisis -- Eighty percent of dairy farms in two Vermont counties reported crop losses for cutting grasses as a result of armyworm infestations in 2001. This resulted in a substantial loss of feed for farmers, and the threat of further losses should the problem not be quickly resolved. Informational meetings brought over half of the counties' farmers to attend. The meetings brought together farmers, Extension professionals and state agricultural representatives. The primary messages sent to farmers were the need to trim the edges of their fields and ditches, to maintain a clean farmscape in order to minimize egg-laying habitat for the army worms, and to rapidly harvest and remove infested crops. Follow-up publications in local news journals offered suggestions for feed resource inventory analysis and budgeting.

Impact:

Meetings led to an immediate observable increase in the number of farms with trimmed edges and ditches. The meetings strengthened relations between state agricultural agents, Extension professionals, and farmers in several counties.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Innovative Farming Techniques

Optimization of irrigation efficiency in the Vermont vegetable industry -- There is a need for research in the area of vegetable irrigation based on the value of the industry, challenging weather and climate, and competing uses for land and water. This project examined the effectiveness of compost application at reducing total irrigation-applied potato crops. Results indicate that initial compost application to a sandy soil can reduce the irrigation necessary to maintain 65% plant-available water by approximately 22% without significantly affecting potato yield.

Impact:

Farmers will use this information to reduce the amount of irrigation necessary for optimum potato yields on certain soils.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

National Goal Area 2: A safe and secure food and fiber system.

Children and adults across the State of Vermont face the challenging problem of experiencing a lack of continuous access to nutritious, safe, acceptable, and affordable food. Food security is an issue in the remote rural areas of the state and in the populated urban areas, affecting people of diverse ages and backgrounds. In 1999, USDA released estimates on the prevalence of food insecurity and hunger by state. In Vermont, an estimated 7.7% of households were food insecure, and 2.6% were food insecure with hunger during the period between 1996 and 1998. For this reason, the new Healthy Vermonters 2010 report includes the objective to "increase food security to reduce hunger" statewide. In stark contrast to this lack of food security for so many

Vermonters is an agricultural state that prides itself on production of a wide range of healthful and tasty products that are enjoyed by millions of people across the country.

Since 1991, the USDA/CSREES food safety contacts from the six New England land grant universities have worked together on a variety of collaborative food safety initiatives funded by USDA food safety competitive funds. The New England states are small in geographic area and have similar food safety concerns. The food industry is generally characterized by small and medium sized operations producing a variety of specialty foods. The tourism industry plays a major role in all of the state's economies and employs more than several thousand people, many in seasonal operations. Many of these collaborative food safety projects have received national recognition. For example, the FDA has selected "Looking for A SAFE Harbor", a food safety curriculum targeted to the volunteer cook, to use as a guideline for how best to train volunteer cooks. In addition, the Conference for Food Protection, a state regulators' group, has added SAFE Harbor to the CFP's guidelines for use to train volunteers at temporary food establishments.

In 1998 collaborative efforts were expanded to include the entire northeast region and beyond. Faculty worked with faculty from New England, New York, Wisconsin, Washington and West Virginia on food safety programs that emphasized reducing microbial contamination on produce.

In the fall of 2000, the New England land grants were awarded USDA food safety funds for a project entitled "Using Good Agricultural Practices (GAP) to Integrate Food Safety Principles Into Small Farm Production". The unified regional program proposed would integrate research initiatives with innovative educational approaches that benefit the small farmer with their implementation of voluntary GAP practices. Pre-implementation survey results of over 600 farms by the New England Good Agricultural Practices (GAP) project indicated that just half of the farms had health and sanitation training programs in place, and at least 70% of respondents desired more information on on-farm safety, manure application, personal health and hygiene, use of sanitizers, good agricultural practices, and microbial hazards. A consumer survey distributed as part of the same project showed that New England consumers do not feel highly confident about the safety of domestically produced fruits and vegetables, with most respondents indicating they thought food contamination occurred prior to being stocked in retail outlets. New England consumers also indicated overwhelmingly that they would be willing to pay more for fruits and vegetables grown on GAP certified farms. The results of these surveys are playing a strong role in adapting and revising curricula to develop more relevant outreach efforts. In 2000-2003 NFSH faculty will collaborate with faculty from a variety of disciplines on two multi-state, interdisciplinary projects targeted to growers with the goal of reducing microbial contamination on fruit and vegetables produced in the Northeast. These projects will involve faculty with expertise in agriculture, horticulture, community development, and nutrition and food safety. Growers, truckers, wholesalers, retailers and consumers are also involved in the development and implementation of the projects.

Researchers from the Centers for Disease Control and the Food and Drug Administration estimate that from 6.5 to 33 million Americans become ill each year from microorganisms in their food. According to Vermont State Department of Health epidemiologist, Susan Schoenfeld, there were 323 cases of reported and confirmed foodborne illness in 1998 (21 cases of E. coli-0157. H7, 144 cases of Salmonella, and 158 cases of Campylobacter). Vermont does not currently require certification or licensing of food handlers, however there is a national trend towards certification and implementation of food safety systems (such as HACCP - Hazard

Analysis Critical Control Points). Food service establishments with high employee turnover and few opportunities for food safety and sanitation education may exacerbate the risk of foodborne illness. Specialty food producers and processors often start a business with limited knowledge of the skills or the regulatory requirements needed to insure a safe and wholesome food product. Since 1991, University of Vermont Extension has developed and implemented food safety programs targeted to professional and volunteer food managers and handlers, specialty and home food producers and consumers. In 1998, University of Vermont Extension faculty initiated food safety programs targeted to local fruit and vegetable growers emphasizing good agricultural practices. The majority of the University of Vermont Extension food safety programs are the result of collaborative efforts with other land grant universities, agencies and organizations. Continuation and expansion of this effort will help to reduce the risk of foodborne illness in Vermont.

As a result of a partnership between the Vermont Department of Education and University of Vermont Extension, 23 food service workers have passed a nationally recognized Food Safety and Sanitation course developed by University of Vermont Extension. In addition to improving the food environment for children in schools, these participants are eligible for promotion and pay raises.

Important research in the area of food safety demonstrated that milk distributors may need to re-evaluate their sell-by-dates and/or processing techniques to ensure a higher quality product reaches consumers. Similarly, studies of maple syrup production demonstrated that producers need to determine the levels of lead and other contaminants they may be introducing into their products during processing, and change equipment and practices to ensure a safe product reaches consumers.

As biosecurity threats increase, the need for biosecurity training is evident. University of Vermont Extension personnel have produced a biosecurity manual for animal production farmers, and held meetings to advance its use, resulting in the posting of biosecurity-related signs on farm buildings throughout the State of Vermont.

Key Theme: Food Handling

School Food Safety and Sanitation certification program -- Children are more vulnerable to foodborne illness due to the fact that their immune systems are not fully developed. Many children in Vermont eat breakfast, lunch and snacks at their schools. The Vermont Department of Education, in partnership with University of Vermont Extension, who developed a curriculum, offered training in Food Safety and Sanitation to school food service workers. The ten-hour certification course is recognized by the American School Food Service Association. Twenty-three school food service workers completed the training and passed a certification test with scores of 70% or greater.

Impact:

Extension expertise was used to design a nationally recognized certification course in food safety and sanitation for school food service workers. The 23 service workers in two Vermont counties who have taken the training and passed the certification test gained knowledge and skills covered in the training, and the certification makes them eligible for a promotion and pay raise. This combination of education and incentive developed through a partnership between University of

Vermont Extension and the Vermont Department of Education will lead to safer and more sanitary school food environments for Vermont children.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Food Safety

Maple sap and syrup practices and education to reduce lead contamination -- Lead is a contaminant of maple sap and syrup. This project seeks to identify the major sources and sinks of lead and other heavy metals in the collection and processing of maple sap into syrup, and to develop methods for reducing contamination of maple syrup with lead and other unwanted substances. Lead concentration in maple sap and syrup were measured at all stages in the production process. Only minor levels of lead occur naturally in sap (< 10 ppb). However, high lead concentrations (> 500 ppb) were found in a small percentage of maple syrup samples. Major sources for consistent lead introduction were: lead-containing metal spouts and collection buckets, and lead-soldered evaporators. In evaporators, backpans contributed the highest amounts of lead. Storage for periods longer than six months in lead-soldered barrels increased syrup lead levels.

Impact:

Results from research indicate that lead levels in maple syrup production and processing can be managed effectively via a combination of limiting the amount and timing of exposure of sap to lead-containing materials through a process of frequent collection and elimination of materials containing large quantities of lead (especially template), through good filtering, and by occasionally monitoring syrup lead levels. Maple producers can use this information to ensure that their products are below lead action levels.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

New England Good Agricultural Practices (GAP) project -- The New England Good Agricultural Practices (GAP) project was designed to assess, educate, implement and evaluate GAP principles related to food safety for small farmers in the six New England states. The initial assessment segment of the project, which took place this program year, included two surveys. The first survey asked New England growers about their current on-farm practices and awareness of and interest in GAP education. The survey asked questions that reflected the areas of food safety concerns found in the GAP guidance - water and water quality, manure and biosolids, field sanitation, worker health and hygiene, sanitary facilities, packing facility sanitation, transportation and traceback. Over 600 farms in the region were randomly surveyed and 296 (47%) were returned. The surveys returned clearly showed that there were many key elements of GAP already in place - particularly in the areas of worker health/hygiene and field sanitation. Fifty percent of farms indicated that they had health and sanitation training programs in place, and approximately 90% had accessible toilet and handwashing facilities for their workers. In addition, 78% of those surveyed indicated that ill employees were either excluded from work or worked at jobs that do not require contact with food. However, there were indications that implementation of adequate measures to insure water quality and adequate cleaning/sanitation practices may be more limited. While many respondents had already received information about food safety, 87% of those surveyed were interested in learning more about on-farm food safety with over 70% indicating that manure application, personal health/hygiene, use of sanitizers, GAP and microbial hazards all would be very helpful.

A consumer survey was also developed and randomly distributed throughout the six New England states. The main objective of the survey was to evaluate consumers' food safety concerns regarding fruits and vegetables and any preferences for produce that is grown by farms with a GAP program. Of 3,000 New England consumers surveyed, 742 or 24% returned completed questionnaires. Generally, New England consumers (63%) felt that domestically produced fruits and vegetables were safer than imported products. However, only 22% of the respondents indicated that they were completely confident in the safety of fruits and vegetables in the U.S. while 63% were only somewhat confident and 14% were doubtful. In addition, when asked where they thought produce most often became contaminated, 64% of respondents indicated that they thought it would occur prior to being stocked in retail outlets (e.g. on-farm, warehouse and/or during transport - all areas that good agricultural practices and programs would impact). New England consumers (84%) indicated that they would be willing to pay more for fruits and vegetables grown on a GAP certified farm. A third assessment component that took place this program year involved delineation of microbiological flora on selected produce. Volunteer farms, in all states, have already participated in the "pre-GAP" microbiological evaluation. These farmers have committed to the educational programming that will be used to implement GAP principles during the 2002 growing season and "post-GAP" microbiological assessment. Here in Vermont, six growers (one each from Newbury, Fairfax, Essex, Shelburne and Burlington) took part in the microbiological evaluation. Vermont crops sampled included apples, lettuce, and strawberries.

Impact:

The results of the surveys will be used to develop more relevant and useful outreach programs for farmers and consumers, accompanied by practical and achievable on-farm food safety goals for producers. The microbiological baseline evaluations have set the stage for determining the impact of the program as it progresses on those farms adhering to the principles.

This multistate project was funded by Smith-Lever Act funds for the State of Vermont and other New England states.

Key Theme: Food Security

Dairy farm biosecurity management practices – Biosecurity management practices are lacking on many dairy farms. A manual of biosecurity management measures was produced, and informational meetings were held for farmers.

Impact:

Many questions were answered for farmers, biosecurity signs with instructions are now being posted on barns throughout Vermont, and the Farm Service Agency is using the Biosecurity Management Manual checklist in all of their offices.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Food Quality

Milk Quality– Pasteurized fluid milk accounts for the majority of dairy product consumption in New England. The production and availability to consumers of high quality, safe milk is important to continued sales of fluid milk. Microbiological criteria are being used as measures to determine if good manufacturing practices (GMP's) and cleaning/sanitizing regimens are effectively preventing milk quality problems. Results indicate that some processors may wish to reevaluate their present sell-by dates in order to insure compliance with current Pasteurized Milk

Ordinance (PMO) regulations. Pinpointing sources of microbiological contamination impacting shelf life can be sued to eliminating these sources, resulting in a continued supply of high quality milk, and longer shelf life for milk being sold to consumers.

Impact:

Data permits processing plants to determine the need for re-evaluating sources of contamination and appropriate sell-by dates for milk they are making available to consumers. This will help the sales of milk in the future.

This multistate project was funded by Hatch Act funds for the State of Vermont and other New England states.

National Goal Area 3: A healthy, well nourished population

Health care is critically important to all Vermonters. Health care costs in the nation and in Vermont are escalating due to the aging population and the advances in medical technology. Lack of sufficient access to affordable health care means fewer opportunities for prevention. Vermonters are confronted with isolation and gaps in rural delivery systems and a lack of professional expertise. In the 21st century University of Vermont Extension Nutrition, Food Safety and Health (NFSH) faculty and program staff will focus on prevention and empowering people to practice healthy life styles. It is our expectation that our consumers will adopt healthy lifestyles by reducing high-risk behaviors and taking responsibility for health decisions.

Three of the leading causes of death in Vermont, cardiovascular disease, cancer, and diabetes are largely preventable with lifestyle changes. Each year in Vermont, approximately 1,100 people die from some form of cancer, and 1,543 die from heart disease and stroke. An estimated 30,000 Vermonters have diabetes, with about one-third of the cases not yet diagnosed. According to "Healthy Vermonters 2010", one of the most effective ways to improve the health of the overall population is to improve nutrition and physical activity. In fact, consuming a diet low in fat and high in fruits, vegetables, and fiber, participating in regular physical activity, and achieving and maintaining a healthy body weight are all behaviors that would modify Vermonters' risk for developing chronic disease. Unfortunately, initiating and sustaining behavior change is difficult and requires changing attitudes and acquiring new skills and knowledge. University of Vermont Extension is in a unique position to help Vermonters achieve these changes. Through practical education, linking diet and physical activity changes to reduced risk of disease, Extension can help Vermonters lead healthier, more productive lives. Eight educational programs, including Dietary Guidelines, Dining with Diabetes, Food, Fun and Reading, Get Engaged – Healthy Aging, Make Nutrition Compute, Making It Fit, reached a total of 3,123 Vermonters, including 275 youths, and more than 400 senior citizens. Results of these programs show that they have served to make a significant impact on human attitudes and behaviors toward nutrition, lifestyles, and meal preparation.

The Expanded Food and Nutrition Education Program (EFNEP) is an integral component of NFSH programming efforts. For over 30 years, EFNEP has helped families living in or near poverty - especially those with young children to acquire knowledge, skills, and changes in behavior to achieve adequate diets providing normal nutrition. EFNEP educators, trained paraprofessionals supervised by nutrition professionals, provide in-depth education to adults and youth using a variety of hands-on methods, tailored specifically to meet the needs of limited

resource families. Data from a cost benefit study done on EFNEP in Virginia has shown that for every dollar spent on EFNEP, \$10.64 is saved in health care costs. The EFNEP program reached over 300 families, and 600 youths. University of Vermont Extension will strive to continue and expand our work with this audience who truly appear to benefit from our resources. This year, in the research arena, studies have offered useful information for such projects, including data to help dispel myths about the inappropriateness of drinking flavored milk by children and information showing high correlations between maternal and child milk consumption rates.

The Vermont elderly are another population at particularly high nutritional risk for a variety of reasons. A 1997 national study found that 8% to 16% of the elder population had experienced food insecurity within a six-month period. A recent evaluation of the elderly Nutrition Program of the Older Americans Act showed that 67% to 88% of participants were at moderate to high nutritional risk. Although the Older Americans Act mandates the provision of two nutrition education units per year per program participant, four of the five Vermont Area Agencies on Aging do not have qualified nutrition professionals for providing nutrition education. University of Vermont Extension has been asked to help address this unmet need. Programs targeting the elderly reached more than 200 Vermont seniors, in addition to a newsletter, Words to the Wise, with a circulation of over 3,500. Introducing educational programs, and computerized and mailed information resources to home-bound elders showed marked improvements in food resource management practices, food safety practices, and mean key nutrient intakes.

Key Theme: Human Health

Dining with Diabetes -- An estimated 30,000 Vermonters have diabetes. Improved diet and exercise habits have been shown to help control diabetes and reduce complications such as blindness and kidney failure. "Dining with Diabetes," a three-part series of classes, teaches people how to control their blood sugar through diet. Sixty-eight participants in three sites across the state participated in the Dining with Diabetes program.

Impact:

Participants showed improved skills at planning and preparing healthy and highly palatable meals. Participants also reported significantly increased confidence levels relative to their ability to prepare healthy meals for someone with diabetes. Better diets lead to fewer health problems and lower medical expenses.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Expanded Food and Nutrition Education Program -- Although American diets in general are not meeting the recommended dietary guidelines, the average diet quality of people with limited resources is lower than the general population. An Expanded Food and Nutrition Education Program (EFNEP) targets families with limited resources to improve their nutrition, food safety, and resource management practices. In 2001, educational programs were provided for 305 adults and 821 youth.

Impact:

Seventy-six percent of adult graduates improved at least one food resource management practice, 87% improved at least one nutrition practice, and 58% improved at least one food safety practice.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Novel approach for delivering nutrition, food safety, and health information to Vermont's elderly -- Many older individuals are at increased risk for nutritional deficiencies and food borne illnesses due to various factors associated with aging, including physical disabilities, chronic diseases, social isolation, and sensory losses. The purpose of this research project is to determine if the Internet is an effective way to provide nutrition and health information to the elderly. Research and outreach personnel are presently working on the first phase of this project, which involves the development of an interactive, multimedia, touch screen computer application, designed to collect nutrition and health information as well as deliver nutrition, food safety and health information tailored to the needs of older adults.

Impact:

Elderly Vermonters will have access to this user-friendly Web application via computers placed in selected community senior centers.

This project was funded by Smith-Lever and Hatch Act funds for the State of Vermont.

Effectiveness of Internet support for the maintenance of weight loss -- Maintaining intentional weight loss is problematic for many Americans. This project will determine if the Internet can be used as a vehicle to enhance long-term weight maintenance. After a period of weight loss, 122 subjects were randomly assigned to an Internet site, in-person counseling, or control group. Internet was not more effective than face-to-face contact in promoting weight loss.

Impact:

The negative study results can be used to evaluate future uses of the Internet for health behavior change.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Predictors of milk consumption in U.S. school-aged children: Evidence from USDA nationwide Food Consumption Surveys -- Milk consumption of U.S. children has declined over the past decade. Annual milk consumption has decreased from nearly 35 gallons per year to approximately 28 gallons per year, while children's soft drink consumption has more than doubled since 1960. Today, fruit drink and soft drink consumption by children is more than double that of milk.

The aim of this project was to determine predictors of milk consumption in U.S. school aged children. Child milk consumption (type and amount) was strongly influenced by maternal milk consumption.

Impact:

The positive association between maternal and child milk consumption should be considered when designing intervention programs aimed at increasing children's milk intake.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Effects of flavored milk on the quality of children's diets – Milk consumption has declined at an alarming rate among U.S. school-aged children. The aim of this study is to determine the association between children's flavored milk intake and their diet quality. Children who consume flavored milk have higher total milk intakes, calcium intakes, and similar added sugar intakes when compared with children who do not drink flavored milks. Children who drink flavored milk also consume fewer soft drinks and fruit drinks.

Impact:

These data help to dispel myths surrounding the appropriateness of flavored milk in children's diets and demonstrate that flavored milks are a nutritionally superior beverage choice over other popular non-milk options.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Human Nutrition

Get Engaged in Healthy Aging project -- Nutritionally at-risk elders receiving home-delivered meals and people with limited resources may lack access to nutrition education. This project provided nutrition education to 28 at-risk elders and 38 limited-resource adults in their homes using laptop computers.

Impact:

Program results showed at-risk elderly participants made improvements in one or more of the food practices: food resource management practices (87%), food safety practices (38%). Mean nutrient intakes for at-risk elderly participants improved for protein, iron, calcium, vitamin A, vitamin C, and vitamin B-6. At-risk elderly participants also increased their intake of the recommended servings from the five food groups.

Limited-resource adult participants reported increased intake of the recommended number of servings from grain, vegetable, fruit and meat/alternative groups. Mean reported intakes of protein, iron, calcium, vitamin A, vitamin C, and vitamin B-6 also increased for limited-resource adult participants.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

National Goal Area 4: Achieve greater harmony between agriculture and the environment.

Small densely populated communities surrounded by working agricultural landscapes and diverse forestlands characterize the scenic quality of Vermont's environment. In addition to providing quality habitat for Vermont's wildlife, much of these woodlands support recreation, tourism, and wood products industries that contribute significantly to the state's economy.

Vermonters are very cognizant of the natural environment of their state, and the citizenry has supported aggressive land-use legislation impacting farm land use practices. Hence, farmers have had to become more aware of, and employ, more environmentally sound management practices. Extension has been at the forefront in assisting farmers as they strive to comply with regulations and public expectations.

Water quality is one area of concern for Vermont residents. Results from research indicate that lower P content dairy feeds, field buffers, and the utilization of nutrient management consultants represent a low-cost option for reducing the negative impacts dairy farming has on unwanted

organic content in waterways. A multistate project involving ten communities along the Connecticut River is designed to improve water quality while balancing the needs of residents in communities sharing borders with the river. One important outcome of these efforts is the agreement of the communities to develop a Water Quality Consortium for the river valley, with the goal of outlining educational activities that will bring Vermont and New Hampshire residents together to consider ways to protect the Connecticut River.

In conjunction with University of Vermont's School of Natural Resources and the Lake Champlain Sea Grant, University of Vermont Extension developed the Watershed Alliance to provide schools and educational youth organizations with the necessary tools to implement a watershed ecology curriculum. The expertise, curricula, physical watershed models, water quality testing equipment, and technical support provided over the past three years, have made it possible for 12 schools and 1,260 students to learn and collect consistent, accurate data on six of 17 major Vermont watersheds, learn about their impact on watersheds, and learn ways to become part of the solution to improve water quality in their local areas. Students presenting data to state officials led to a decision to boil drinking water in one town during a period when high bacteria levels were noted. Student data also led to improvements in a wastewater treatment plant in another town.

Integrated Pest Management programs aimed at apple, greenhouse, and vegetable growers reached thousands of growers, with at least 50% of those attending face-to-face programs (more than 600 people) reporting that at least one IPM practice learned from the workshops was being employed. Another finding was that 100% of survey respondents of apple IPM educational programs said they employed IPM information in their orchards, with 67% saying they frequently or almost always used the information. Additionally, 97% of respondents reported a reduction or minimization in pesticide use through information gleaned from the programs.

With over eighty percent of land covered by forests, Vermont ranks third in the nation in percent of forest land-cover. Eighty-three percent of this land is privately owned and managed with a wide range of landowner objectives. The largest amount of privately owned forestland is held by individuals whose goal is to use the land for income, recreation, or personal stewardship. This privately held resource base provides wildlife with forested habitat, protects air and water quality, and provides Vermont residents and visitors with a variety of recreational opportunities. Private woodland owners provide the wood products industry with raw materials to support almost one-fifth of Vermont's total manufacturing labor force. Due to private ownership, economic needs must be addressed in concert with the demand for other, less tangible products from Vermont's land base, such as recreation, aesthetics, ecosystem management, and protection of water resources.

Sugar maple is important to the Vermont economy, as agribusiness and value-added maple products bring in \$100 million per year to Vermonters. In addition \$12 million is earned annually from farmgate sales of maple syrup. To this can be added about \$100 million received from tourists coming to Vermont to view fall foliage. Entomopathogenic fungi are being developed as an alternative to pesticide use for the management of pear thrips, a maple tree pest, in sugar maple forests. Forest trees are threatened by other insect pests, such as the incidentally imported Asian longhorned beetle, which has already been observed in New York and Chicago. A large public and landowner awareness campaign has heightened public awareness of the threat and implications of beetle infestations for Vermont forests. This campaign serves as a proactive

approach to managing a potentially devastating pest, and increases the likelihood that rapid detection and eradication efforts can reduce forest and economically important tree losses.

Apples are an important commodity for Vermont. Of all the different fruits grown and harvested for sale in Vermont (i.e., strawberries, blueberries, raspberries, etc.), apples comprise 92% of total acreage planted to fruit in the state. The apple industry generates jobs and supports communities and businesses in each county in Vermont. Annual cash receipts are estimated at \$7.9 million and, when value-added products are considered, the value of the crop is reported at \$25-28 million. For Vermont orchardists, 72% of their total farm income is generated from apple production. In addition, orchards are a part of Vermont's agricultural diversity, contributing to the scenic rural vistas for which Vermont is well known and which generate a significant income for the region from tourism. Costs to the apple industry from insect pests are due to both insect control costs and damage costs, and reach nearly \$1 million for orchard growers annually.

In collaboration with existing partners and in cooperation with new partners, University of Vermont Extension faculty provide leadership to help Vermonter's solve problems to ensure the economic sustainability and ecological integrity of Vermont's valuable natural resources.

Key Theme: Integrated Pest Management

Vermont Apple IPM Program -- Vermont Apple IPM Program included in 2001: orchard visits and one-on-one interactions to provide 'site-specific' information, workshops, meetings, farm tours, *The Vermont Apple Newsletter*; *IPM Alerts*, the *Vermont Apple IPM Focus* website for apple IPM education and information (<http://orchard.UniversityofVermont.edu/UniversityofVermontapple/pest>), *AIM* (Apple Information Manager) website (<http://orchard.UniversityofVermont.edu/aim/>) developed from a regional IPM collaboration of apple growers and Extension/research personnel from all six New England states, and applied IPM research addressing the priorities and needs as defined by the apple industry in Vermont and the region. Pest management information generated in Vermont and from other participants in the applied research project (NE-183): "Multidisciplinary Evaluation of New Apple Cultivars", which received the **"2001 USDA Secretary of Agriculture Honor Award"** for research excellence, is incorporated annually into the Vermont Apple IPM Program along with other research findings.

Impact:

Evaluations of various components of the Vermont Apple IPM Program (e.g., newsletters, workshops, websites, etc.) revealed that the IPM program is presenting relevant and timely IPM information: 100% of survey respondents said they used the IPM information presented in the program in their orchards with 67% indicating they frequently or almost always use the information; 98% reported that the IPM program improved their IPM practices; and 97% reduced or minimized pesticide use through using the IPM information presented in the program. On-line evaluations of the *Vermont Apple IPM Focus* and *AIM* websites earned praise as valuable IPM resources from around the world. Workshop results show that of 15 people participating, 50% adopted an IPM practice learned at the workshop. Each appropriately used IPM method leads to a reduction in pesticide applications over traditional approaches.

This project was funded by Smith-Lever and Hatch Act funds for the State of Vermont.

Key Theme: Forest Resource Management

Regional Asian longhorned beetle public awareness program – The maple syrup industry contributes nearly \$140 million annually to Vermont’s economy. Nearly 2,000 producers seek up-to-date information on pests threatening maple stands. The Asian longhorned beetle is an exotic pest from China that was recently discovered in and around New York City and Chicago. It has a broad host range, including most hardwoods, and currently represents the greatest threat to the maple industry. Once located in a tree, the only currently employed eradication method is to destroy the tree. The public can play a valuable role in detecting new infestations. University of Vermont entomologists have been working with forestry personnel from Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, and New York to coordinate a public awareness program involving identification cards, posters, and a website.

Impact:

Increased public awareness has made it more likely that Asian longhorned beetle infestations will be quickly identified, thereby preventing large-scale forest and resource losses in the Northeast.

This project was funded by Hatch Act and Smith Level funds for the State of Vermont.

Key Theme: Water Quality

University of Vermont Watershed Alliance – Educational programming for Vermont youth regarding natural resources and the environment is inadequate. Many science disciplines are still being taught in an isolated manner, in part due to a lack of resources and support for teachers and facilitators to incorporate environmental education into their curricula. The University of Vermont Watershed Alliance, a program shared by University of Vermont Extension, Lake Champlain Sea Grant and the University of Vermont School of Natural Resources, provides schools and educational youth organizations with the necessary support and resources, including expertise, curricula, models, water quality testing equipment, and technical support. This cooperative effort makes it possible for students throughout Vermont to bring classrooms outdoors and learn about the watershed in which they live, and communicates to Vermont youth the shared responsibility humans have in protecting our watersheds and preventing water pollution. Students “adopt” a portion of their watershed, collecting, monitoring and analyzing water quality data, and make water quality-related recommendations to their local officials and community members based on their findings. In this way, the Watershed Alliance empowers youth to take action to conserve and protect water resources by enabling them to see that humans are not only part of the problem, but are also part of the solution. The program has been implemented in schools within six of the 17 major watersheds of Vermont. Undergraduate students studying water resource management at the University of Vermont serve as interns, ensuring consistent methodologies and accurate results for compiled data. Students review monitoring protocols and safety procedures, learn about watershed ecology concepts using interactive models, collect water samples for analysis of physical and biological characteristics, and verify results of their analyses by working with technical specialists prior to sharing recommendations with the public.

Impact:

Student participants have carried their knowledge, skills, and enthusiasm to other venues, as evidenced by public service announcements they have developed for radio stations, and presentations conducted for local school boards and planning commissions. Direct impact on town water quality has been noted in several instances. Data submitted to state officials from

one school ultimately led to a town decision to boil drinking water for a period of time, due to high bacteria levels noted.

This project was funded Smith-Lever Act Funds for the State of Vermont.

Balancing environmental and economic impacts of phosphorus management --

Agricultural cropping and dairy production practices contribute phosphorus (P) runoff to surface and ground water resources. This project evaluates the economic and environmental trade-offs of different dairy farm P crop and feeding management practices. Results indicate that the use of lower P content dairy feeds, nutrient management consultants, and field buffers present the least costly farm level methods of reducing phosphorus runoff.

Impact:

Results enable farmers, agricultural professionals, and policymakers to consider financial and water quality trade-offs associated with the implementation of P-reducing farm management practices in order to improve decision making.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Recycling

Properties of composite edible films -- Whey protein-based edible films can replace more environmentally and nutritionally unsafe food packaging materials. The success of whey protein-based edible films depends on novel application concepts and relevant properties. One example would be to replace plastics used for tamper-evident packaging of ice creams with a more environmentally and human-safe composite edible film made using whey proteins. This project examined the microstructure of composite edible films using confocal microscopy, and investigated interactions between films and sensory attributes of ice cream packed in composite edible films. Confocal results revealed crystalline-like lipid distribution. Sensory tests showed the quality of ice cream packed with edible film was not compromised at any time during the study.

Impact:

The research showed that whey protein-based edible films are suitable for tamper-evident packaging of commercial ice creams. Use of whey protein-based films in this way has multiple benefits: edible, biodegradable materials are safer for incidental human and animal consumption, which will lead to fewer human, domestic pet, and wildlife injuries caused by tamper-evident packaging; and more whey by-products are used, leaving less to be dumped into the environment, thereby reducing the negative effects of whey by-products on the available dissolved oxygen content in waterways.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Biological Control

Entomopathogenic fungi for management of pear thrips -- Thrips damage can seriously impact the economics of the agricultural community in Vermont. Sugar maple is important. Agribusiness and value-added maple products bring in \$100 million per year to Vermonters. In addition \$12 million is earned annually from farmgate sales of maple syrup. To this can be added about \$100 million received from tourists coming to Vermont to view fall foliage.

Entomopathogenic fungi are being developed for management of pear thrips in sugar maple forests and other pestiferous species in greenhouse crops. Select isolates were mass-produced for testing in small maple forest plots. Spray application protocols are being assessed on greenhouse crops. Pear thrips populations were too low to evaluate efficacy in maple stands. In the greenhouse trials, spray nozzles and sprayer type significantly affected spore deposition on leaves.

Impact:

Pear thrips are among the most devastating of insect pest for growers. This research will be used to promote the use of entomopathogenic fungi and spray application protocols for management of pear thrips and other pests by maple syrup and greenhouse growers. These industries contribute more than \$200 million annually to Vermont.

Hatch Funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Riparian Management

Multistate Water Quality effort – Water quality is becoming an increasing concern among many Vermont and New Hampshire residents. States that share common water resources need to cooperate in designing effective strategies to ensure that individual state and/or community water quality programs do not conflict with each other. Additionally, many rural communities lack access to information and technical assistance in order to identify and prioritize water quality issues, and to design and implement effective environmental programs. University of Vermont Extension has formed a partnership with University of New Hampshire to conduct a water quality workshop for local leaders and residents living in the Connecticut River Valley region.

Impact:

A majority of workshop participants, representing ten communities along the Connecticut River Valley, indicated they could identify at least one recommended practice they would implement to ensure that community water quality programs would not be in conflict with neighboring communities. One important outcome of the workshop is the agreement of ten communities to participate in the Connecticut River Valley Water Quality Consortium. This task force has set a date to meet formally within the next six months to establish group goals and outline educational activities that will bring Vermont and New Hampshire residents together to consider ways to protect the Connecticut River. University of Vermont and University of New Hampshire Extension will facilitate meetings held by the newly formed consortium.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont and New Hampshire.

National Goal Area 5: Enhanced economic opportunity and quality of life for Americans

University of Vermont Extension programs are designed to empower people and communities through research-based information and education, to address the economic and social challenges facing our youth, families, and communities. Vermonters know that change is inevitable. For many Vermont communities, the type of change during the last 15 to 20 years was not favorable. While jobs dependent upon land and natural resources have declined, the cost of living in rural areas has increased. Studies indicate a number of problems have resulted, ranging from declining levels of voter participation and public apathy toward elections to decreasing interest in

volunteer activities and community groups. They also document the younger generation's apparent disinterest in public affairs and lack of knowledge about our political system. Robert Putnam has quantified this civic disengagement, documenting a 25-30 year decline in membership in civic-oriented organizations.

Rural communities that have survived and prospered have some things in common. In these towns, local efforts are fueled by a positive attitude and guided by a shared vision for the future. They promote open discussion of community needs, opportunities, and ideas in a non-judgmental atmosphere that leads to inclusive decision-making.

The Vermont State federally funded project, Expanding the Caring Community (ECC), focuses on eleven target communities. Five of these communities are new to this project and six target communities continue to receive support after no longer receiving federal funding as the Vermont Youth at Risk project entitled, "Enhancing Community Awareness." University of Vermont Extension works with community leaders to establish a shared vision for the future of children, youth and families. Through open discussion of the current reality against this vision, opportunities and ideas are shared in a non-judgmental atmosphere leading to inclusive decision-making. Community Steering Committees provide leadership for assessment, program initiation/expansion and evaluation working with Extension staff.

Programs included in ECC, such as Vermont Extension's Northeast Kingdom (NEK) Collaborative, have leveraged more than \$13 million in grants and loans supporting economic and community development projects in Vermont communities designated as Rural Economic Action Partnership (REAP) Zones. By creating periodic meetings in which groups such as economic development agencies, non-profit organizations, health care and other organizations having a stake in community well being come together, the opportunity for obtaining useful grants and loans supporting community infrastructure, housing, and rural business opportunities increases. Additionally, more than \$320,000 in in-kind donations and financial contributions were raised in support of community-based improvements. Youth participation rates in community activities benefit from workshops emerging as part of the ECC programs, as well. Youth-oriented programs are based on long-term, sequential learning models that emphasize a combination of creative educational, recreational and experiential approaches to improve life, community awareness, and community involvement skills. To date, 69% of 3,732 participants indicate that they have made at least one positive behavioral change as a result of the program involvement. Follow-up of a smaller sample shows that 33 participants made significant gains in competency-related areas including social skills, assertiveness, tolerance, and managing frustration. This project engages many community members, as 1,577 adults volunteered nearly 60,000 hours (a volunteer value of \$479,025) in support of community based programs.

University of Vermont Extension also provided municipal officers with communication assistance through the Information Technology Capacity-Building in Rural Vermont program. Introducing town and municipal officers to communication opportunities using the internet has helped 50 Vermont communities produce and maintain websites available for municipal businesses. Municipal officers and local planners from more than 100 communities have improved the use of their computer resources as communication tools.

Strong families contribute to positive individual development and quality communities. Family and community related research can provide a strong knowledge base for educating parents, consumers, children and youth, policy-makers, agencies and organizations. A study of the social return on investment of the Vermont Development Credit Union demonstrates that membership

significantly improved financial well being, wealth building, increased control over, and satisfaction with many areas of life, including home, school and work for low-income consumers. Membership in this credit union goes beyond simply helping people with their finances.

Education, highlighting communication skills and decision-making tools, empowers individuals and families to apply practices that result in increased involvement in their communities. Targeted youth and families receive concentrated programming in life skills to enhance their success as active productive community participants. A High School Financial Planning program helped 790 students gain basic knowledge about personal financial planning. Results show that 37% of program graduates demonstrated improved expense-tracking skills, 45% began saving money, or increased the amount of money they saved, and 38% had greater confidence in their ability to manage money effectively. A Babysitting Safety program teaching teenagers the behaviors and skills required to become competent babysitters has provided northern Vermont counties with more than 287 certified babysitters.

Children and adults across the State of Vermont face the challenging problem of lacking continuous access to nutritious, safe, acceptable, and affordable food. Food security is an issue in the remote rural areas of the state and in the populated urban areas, affecting people of diverse ages & backgrounds. In 1999, USDA released estimates on the prevalence of food insecurity and hunger by state. In Vermont, an estimated 7.7% of households were food insecure, and 2.6% were food insecure with hunger between 1996 and 1998. For this reason, the new Healthy Vermonters 2010 report includes the objective to "increase food security to reduce hunger" statewide. University of Vermont Extension faculty and staff took steps in 1998 to promote interdisciplinary programming by developing the People Grow Project. This activity built a strong network of agriculture, food and anti-hunger organizations to create innovative linkages among local food producers, institutions and consumers. Low-income audiences were targeted to receive education in food production (gardening, small farming), food preparation, preservation, nutrition, and food safety. As an outgrowth of these efforts, the current 4-H gardening project works with low-income youths to build skills in gardening and community involvement. In addition to learning ways to supplement food stores and contribute to the well being of their own families, students experience the responsibility and rewards of giving to others in need. This is accomplished by having students contribute part of their garden harvests to the Vermont Food Bank, local food shelves, and soup kitchens as part of the Plant a Row for the Hungry program. One of the most satisfying outcomes of the project for the 78 program volunteers was learning that the 341 young, low-income gardening students unanimously chose to continue planting a portion of their garden, and in many cases planning to increase the share, to donate to other people in need. The program continues to garner funds for expansion to other communities.

In stark contrast to this lack of food security for so many Vermonters is an agricultural state that prides itself on production of a wide range of healthful and tasty products that are enjoyed by millions of people across the country. New and innovative tools for assisting entrepreneurs with marketing strategies are emerging from the academic activities of faculty and students. Providing test sites in Vermont communities for this research is an effective learning opportunity for students, teachers and community members. Business people, state agency personnel and others have found that collaborations can be the key to success when managing change for a small state, such as Vermont. A multi-institutional program run with Cornell University involved the development of the Northeast Center for Food Entrepreneurship (NECFE) in order to provide a

centralized source of information and assistance for small and start-up food manufacturing businesses in the region. The center provides one-stop shopping for business owners and managers in need of advice and information regarding product processing, packaging, labeling and marketing regulations. Efforts of NECFE have led to the evaluation of 456 new food prototypes for safety and technological feasibility, training for 50 instructors in the region who teach business development courses and workshops, the development of Hazard Analysis and Critical Control Point (HACCP) programs for juice, meat, seafood and egg products, the creation of new farmers' markets, and access to pilot plants to produce market trial products and demonstrate proper use of equipment. NECFE has reached over 2,000 potential and actual business entrepreneurs through workshops, websites, and phone questions answered. Efforts have assisted region-based entrepreneurs in developing sustainable manufacturing operations of high quality foods for consumers. Expansion of web-available information and the use of video conferencing is planned for the future.

For many decades, Vermont's landscape has been a strong allure to visitors and residents alike. In many ways, tourism and the quality of community life have become inextricably tied to agriculture. The loss of farms has created concern about conversion of farmland to forest and development. University of Vermont researchers have demonstrated one way, outside of the agricultural sector, farms may have an impact on Vermont's economy. An innovative research approach incorporated visitor behavioral survey data into an economic input/output model to estimate the cost of changes in tourism behavior attributed to farmscape experiences. Based on winter tourist trip data alone, Vermont tourism sector relies on farmscapes for approximately \$119.9 million per year. The Vermont economy, would lose an estimated \$201.5 million, 3,800 jobs, and \$11.9 million in indirect business taxes if farmscapes were not part of the tourist experience. Perhaps the relationship between farming and the quality of life in Vermont is summed up by the following quotation attributed to Frank and Melissa Bryan. "Vermont without farmers could be a good place, but it would never be Vermont; and while there are lots of good places, there is only one Vermont." By analyzing the impact farmscapes have on the Vermont economy, University of Vermont Extension has shown just how much truth there may be to this remark.

Key Theme: Community Development

Northeast Kingdom Collaborative -- Many rural areas face economic and community development issues having a very different character than communities whose needs are mainly defined by poverty. Often, the defining features are geographic isolation of communities separated by long distances, absence of large metropolitan centers, low-density settlement patterns, historic dependence on agriculture, continued population loss, out-migration, and economic upheaval or economic distress. The three counties of the northeastern corner of Vermont comprise Vermont's Northeast Kingdom, a term coined by the late Senator George Aiken to identify a region which has long challenged policy makers because of its seemingly endemic poverty, chronic underemployment, and traditional, independent, Yankee rural character. Regardless of the role of rural culture, quantitative social and economic indicators consistently substantiate the status of the Northeast Kingdom (NEK) as the area of Vermont most in need of social program assistance. Unemployment in the region typically runs between 50 and 100% of state averages, home value is half of the state average, and per capita income stands at 75 to 80% of the state average. The percent of the population below poverty level for all three counties is between twelve and fourteen percent, with several towns showing as high as 22% of the population living below the poverty level. The Northeast Kingdom is designated as a Rural Economic Action Partnership (REAP) Zone by the USDA (November 2000). The NEK

Collaborative was formed in 1996 to find ways to collaborate on economic and community development issues in the “Northeast Kingdom.” The NEK Collaborative is comprised of members from economic development agencies, non-profit organizations, health care and other organizations dedicated to improving economic and community well being for people in the Northeast Kingdom. Periodic strategic planning and benchmark monitoring meetings have taken place since then.

Impact:

Since receiving REAP status, the NEK Collaborative has leveraged more than \$13 million in grants and loans supporting projects for the Northeast Kingdom, primarily in areas of community infrastructure (water and waste disposal), single and multiple family housing, and rural business opportunity development. University of Vermont Extension has received a \$30,000 grant from the Snelling Center for Government in order to serve as the administrative partner for the NEK Collaborative, work with committees to establish and evaluate progress toward benchmarks for projects included in the strategic plan, maintain web publication of documents, and submit reports to USDA as required. One town has been pursuing steps toward the development of a new business and workforce opportunity in the area where a major employer closed its doors, leaving many in this small community out of work. The new alliance provided the opportunity, through funds awarded, to purchase the existing facility and equipment and develop wood products for retail both in this area and other markets. Efforts have led to nine communities being awarded almost \$15 million in combined awards to develop wastewater projects. Four communities have been awarded \$900,000 for rural and low-income housing development projects as result of NEK collaborative efforts.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Youth Development

Expanding the Caring Community -- Through the Expanding the Caring Community (ECC) Project, University of Vermont Extension fosters youth development in rural communities by teaching life, community awareness and community involvement skills, through creative educational and recreational activities. This is the fifth in a five-year funding period for this project. The focus of ECC has been to provide participants with sequential learning experiences over an extended period of time (150 program contact hours) with positive adult role models.

Impact:

To date, 69% of 3,732 participants indicate they have made at least one positive behavioral change as a result of program participation. Additionally, a smaller sample of youth participants showed that over a sixteen-month period a group of 33 participants made significant gains in competency-related areas of social skills, assertiveness, tolerance, and frustration. This project engages community members, as 1,577 adults volunteered 59,866 hours (a volunteer value of \$479,025) in support of one or more community-based program. Additionally, more than \$320,000 in in-kind donations and financial contributions was raised this year by community members to support the program. The more than \$100,000 in financial contributions has assisted in sustaining programs in five state sites.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Tourism

Study of the contribution, linkages to agriculture, and tax policy impacts on the tourism industry in Vermont: A general equilibrium approach -- Since the 1800's Vermont's tourist industry has depended upon the agricultural heritage and landscape for its comparative advantage in the New England tourism market. However, this landscape is changing. The number of farms in Vermont decreased 79.5% from 1910 to 1997, and acres in agriculture decreased 65% from 1950 to 1997. Economic pressures have reduced the incentives to farm, and technology has changed the way dairy farms are managed, causing a gradual transition from open farmland to either forest or development. This study gathered data through surveys of visitors to Vermont to determine how the disappearance of the farm landscape would affect their willingness to visit the state. The survey instrument included pictures of scenery with and without farm elements. The potential change in the number of tourist trips was estimated and an input/output model was used to evaluate the impact this would have on the tourism industry sector and the state economy as a whole in terms of direct, indirect and induced effects on jobs, industry output, personal income, and indirect business taxes. Impacts were calculated for a sample of 281 tourists traveling during one winter weekend in Vermont. Using multipliers developed with the input/output model, and projecting results from this sample to the population of winter tourists to Vermont, the value to the Vermont economy of the farm landscape can be estimated as \$119.9 million per year in direct tourism sector output. If Vermont loses one trip for 59% of all winter travelers (as extrapolated from survey results), the total loss in output effect to the state economy is estimated to be \$201.5 million, 3,800 jobs, and \$11.9 million related to indirect business taxes.

Impact:

The losses in output values, employment opportunities, and tax revenues to the State of Vermont estimated from the results of this study indicate the specific dollar values to the state of the farm landscape as a "visual resource." As such, they represent a measure of the public demand for the social value of the farmland. These estimated losses also provide a tool for determining the level of investment justified to support farms, farmers, farming activities, and farm preservation programs.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Jobs/Employment

Rural and Farm Family Vocational Rehabilitation Program -- Vermont farm and rural residents face dangerous work environments. Accidents may result in disabling conditions that prevent experienced farmer workers from working and contributing to the agricultural economy. The Rural and Farm Family Vocational Rehabilitation Program (RFFVRP) assists disabled clientele, providing training, job placement, financial planning, and equipment and site modifications consistent with abilities and interests. The program worked with 150 participants in the 2001 fiscal year.

Impact:

Sixty-one individuals were successfully placed in competitive and gainful employment. These previously non-working persons, disabled in farming accidents, now contribute to Vermont's economic welfare and development through gainful employment.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Youth Development/4-H

4-H Gardening Project – This 4-H gardening project connects volunteers with low-income youth to build skills in gardening and community involvement. Students at sixteen locations learned about gardening, from soil types to selling produce at auction, through an experiential learning process. Sharing their crops at the local food shelf also encouraged students to participate in an activity demonstrating multi-generational social responsibility and cooperation. In Vermont’s central region, 341 youth participated in the program with the assistance of 78 volunteers and coordination by Americorps members. Education on organic gardening and micro-business skills were added to the program with a grant from the Northeast Organic Farming Association. Local businesses and individuals donated an estimated \$5,000 in seeds, seedlings, and supplies.

Impact:

Through the Plant a Row for the Hungry program, young gardeners donated over 125 pounds of freshly grown produce that they grew to the Vermont Food Bank and local food shelves and soup kitchens. Evaluations from participants indicated a unanimous intent to continue to plant extra plant rows to share with those who have less, with many planning to add plants or rows for this purpose. The program received \$4,000 from the Food Stamp Nutrition Education Grant program and \$1,000 from the Vermont State 4-H Foundation, and the Farm Service Agency offered to fund garden supplies to help expand the program to additional sites.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Promoting Business Program

Northeast Center for Food Entrepreneurship – It is challenging for small food manufacturing businesses of agricultural products to succeed in highly competitive markets. Many small businesses fail, often because they lack the technical and business knowledge to compete. The Northeast Center for Food Entrepreneurship (NECFE), a joint project of the University of Vermont and Cornell University, now makes that knowledge available to small food entrepreneurs in New England and New York. NECFE is in the second year of a four-year program funded by the USDA Fund for Rural America. The \$3.8 million competitive grant was the second largest award made by USDA to a university.

The Center provides assistance in developing a business and products, ensuring product safety, transferring technology to small businesses, and taking products to a commercial level. In a small state like Vermont, such comprehensive help can be crucial to successfully develop a fledgling business. In total, the NECFE laboratory analyzed and logged 456 food prototype samples in a database as part of a program to address their safety and technological feasibility. The Center has assisted in the development of HACCP programs for juice, meat, seafood and egg products, explained labeling regulations, developed nutrition facts for new products, collaborated in the formation of farmers’ markets, provided technical support for shared-use kitchens, and provided access to pilot plants to manufacture batches of products for market trials and to demonstrate the proper use of small-scale equipment. “Just tracking down regulatory assistance [to meet production, food, safety, packaging, and marketing regulations] can be a full-time job, and it takes away from their other work. With NECFE, it’s one-stop shopping.” NECFE staff members walk entrepreneurs through all of the steps of processing, packaging, and marketing foods. The Center offers workshops on production techniques and business development. This year, for example, the Center has presented workshops on making cider, producing acidified foods, and food safety training for more than 50 people who teach business development and planning to small entrepreneurs. The Center has published three newsletters

for paper and electronic format providing information on food safety, regulations, processing techniques, training opportunities, and entrepreneurial profiles as a way to increase the knowledge level of new business entrepreneurs, and to facilitate awareness of current food business issues. NECFE has reached over 2,000 potential and actual business entrepreneurs through these efforts. NECFE's website provides a wide range of information, and video conferencing is planned for the future.

Impact:

NECFE has developed and expanded a growing network of partnering organizations in the Northeast that benefit both service providers and small-scale processors. Providing entrepreneurs with the right tools and continued support while starting and operating a food venture, the Center has increased business opportunities for economic sustainability and growth. NECFE assisted a cheese spread and maple fruit syrup manufacture to expand sales from Vermont to areas throughout New England and, recently, to Germany. "The Center has been great," the manufacturer says. "I knew I wanted a premium, high-end product and there was no way I was going to make it in my kitchen. So when I heard about the Center, it all gelled. And when I run into questions and problems, Brian [a NECFE consultant] is the first person I call." Another manufacturer of fine desserts has stated, "NECFE has been wonderful for finding sources of ingredients, and I think, as we get going with some mass-produced products, we'll ask them [NECFE] to help us set up a system."

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Promoting Business Programs

Women's Agricultural Network -- Women are less likely to apply for, and use, services provided by USDA agricultural programs. The Women's Agricultural Network (WAgN) offers education and support to women starting agriculture-related businesses, with the goal of improving business management skills and awareness of USDA-sponsored programs. More than 1,300 women received assistance by attending one or more WAgN programs. Thirty women completed a pre-business planning course, and nineteen completed business plans.

Impact:

143 women reported improved management strategies as a result of attending one or more Women's Agricultural Network programs. Several women reported the information helped them make decisions about taking out loans for their businesses, and others used the information to revise marketing strategies.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Consumer Management

Vermont Development Credit Union: Decreasing poverty through assets development -- Low-income individuals and some economically disadvantaged populations, such as women, immigrants, the disabled, and people of color, often lack affordable credit and financial services. This study documents the social return on investment of the Vermont Development Credit Union as it performs its mission to provide a financial niche for a population that traditionally has no access to wealth and capital. Results show that membership in this credit union goes beyond simply helping people with their finances.

Impact:

The study's results are useful in designing programs to assist individuals in need of financial assistance that will significantly improve their quality of life by increasing financial well being, wealth building, and increased control over, and satisfaction with, many areas of life, including home, school, and work.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Consumer Management

Financial planning and management education -- Good financial practices contribute to the well being of families. The National Endowment for Financial Education (NEFE) High School Financial Planning Program helps high school students gain basic knowledge of financial planning. Extension work also served to increase the number of teachers in Vermont using the program by three. A total of 35 schools and 36 teachers carried out the curricula to reach 790 students.

Impact:

Results from 790 youth who completed the program showed marked improvements in their personal financial knowledge, behavior, and confidence level related to financial planning: 47% demonstrated they knew more about credit costs; 38% showed increased knowledge about investments; 37% improved skills for tracking spending; 45% began saving money, or increased the amount of money they saved; 38% felt more confident about managing their money.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Communication Skills

Information Technology Capacity-Building in Rural Vermont project -- Municipal officers need assistance in using available local and global computer hardware and software. The Information Technology Capacity-Building in Rural Vermont project teaches skills necessary for accessing state forms, government mandates, and local requests to the Internet for local officials. More than 50 community websites have been designed. In addition, project staff have taught more than 70 workshops at town officer training sessions, and have conducted more over 70 site visits to municipal offices in rural areas of Vermont.

Impact:

More than 50 Vermont communities now have websites available for municipal business. Municipal officers and local planners from more than 100 communities have learned to make better use of their computer resources.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

Key Theme: Child Care/ Dependent Care

Babysitting Safety Program -- Teenagers are being hired to baby-sit without having received proper training or an understanding of safety issues associated with infant and toddler care. A Babysitting Safety Program teaches youths the behaviors and skills needed to become competent babysitters. Life skills that support workforce preparation are also introduced to training participants.

Impact:

As a result of the Babysitting Safety Program, families in northern counties of Vermont now have more than 287 certified babysitters available to them.

Smith Lever funds were used in part or in full to develop this project for the State of Vermont.

University of Vermont Extension and Agricultural Experiment Station Total Resources for FY 2001

In FY2001, 60% of the Vermont Agricultural Experiment Station expenditures were supported by the state and 40% was supported by federal Hatch dollars (including multi-state research funds). The single largest source of support for University of Vermont Extension is determined by the State of Vermont appropriation to the University of Vermont. For each dollar the Vermont Legislature appropriates to the University, University of Vermont Extension receives 12 cents. In FY2001, approximately 72% of Extension's resources came from state coffers.

State support and federal matching funds (Smith/Lever and Hatch) assist both Extension and research faculty in securing other competitive funds and partnerships. For example, in FY2001, Vermont AES researchers were awarded approximately \$4.7 million in competitive grants and awards—a 35% increase from FY2000. University of Vermont Extension faculty were also awarded more than \$1.3 million in grants and contracts.

The following two tables summarize the fiscal and human resources marshaled by the University of Vermont Extension and Vermont Agricultural Experiment Station in addressing the five National Goal Areas as defined by the Agricultural Research, Education, and Extension Act of 1998 (AREERA). Human resources are defined as full-time equivalents (FTEs) for faculty (professional) and technical staff (paraprofessional). Fiscal resources represent an accounting of those federal dollars (Smith/Lever (b), (c), and Hatch) and State of Vermont matching dollars as required by AREERA. Fiscal resources expended on multi-state and integrated activities are documented on the attached CSREES forms (Appendix A and B).

FY2001 Human and Fiscal Resources

Human Resources FY 2002	Extension		Agricultural Experiment Station		TOTAL
	Professional FTEs	Para- professional FTEs	Professional FTEs (faculty)	Para- professional FTEs (tech's)	
1 - Competitive Agriculture	17.07	2	8.3	4.1	31.47
2 - Food Safety	1.37	1.06	1.4	0.06	3.89
3 - Human Nutrition	5.05	0	2.6	0	7.65
4 - Ag and Natural Resources Harmony	3.45	0	6.7	2.8	12.95
5 - Family and Community Resources	10.38	6.75	2	0.3	19.43
TOTAL	37.32	9.81	21	7.9	76.03

Expenditures for FY2000	Extension		Agricultural Experiment Station		TOTAL
	Federal	State	Federal	State	
1 - Competitive Agriculture	633,688	1,589,778	699,428	948,002	3,870,896
2 - Food Safety	83,956	210,627	137,110	125,831	557,524
3 - Human Nutrition	166,401	417,462	118,936	270,734	973,533
4 - Ag and Natural Resources Harmony	136,069	341,367	365,358	515,684	1,358,478
5 - Family and Community Resources	465,950	1,168,962	65,720	180,744	1,881,376
TOTAL	1,486,064	3,728,196	1,386,551	2,040,996	8,641,807

B. University of Vermont Extension and Agricultural Experiment Station Stakeholders

The “Research-Extension-Vermont” connection is a continuous cycle. The Vermont Agricultural Experiment Station (VT-AES) has the unique responsibility to serve the agricultural and related needs of Vermont through research. University of Vermont (University of Vermont) Extension provides access to technology, educational programs and practical information concerning Vermont communities, families and homes, farms, businesses, and the natural environment. Put simply, VT-AES researchers study problems identified by people of the state, while University of Vermont Extension specialists share the results of this and other research with Vermonters, helping them to meet their needs—and bringing back to the University the real-life questions and concerns needing further research.

University of Vermont Extension and VT-AES rely on the input and advice from many Vermonters to help determine the relevance, usefulness, and quality of programs. This advice comes from a variety of sources and in a variety of forms. Working with the Center for Rural Studies, VT-AES and University of Vermont Extension seek input from an Annual Vermonter Opinion Poll, which this year, in addition to its cross-state sampling, targeted urban and rural areas in the Northeast Kingdom and Chittenden County, respectively. More than 700 Vermonters responded on issues regarding attitudes toward community growth and economic development, public education, agriculture, and the environment, and the use of computers and telecommunications technology. When asked to select an issue that came to mind regarding enhanced economic opportunity and quality of life for Vermonters, the greatest number of respondents (71%) cited “education.” When asked to select an issue that came to mind concerning a healthy, well-nourished population, the greatest number of responses was “nutrition”, closely followed by “access to enough food for a healthy life.” Survey responses are used to guide planning in subsequent years.

Individuals serving on advisory boards and councils contribute to the evaluation of existing programs and the planning of new programs. University of Vermont Extension meets with a State Advisory Board four times annually, and receives advice from regional and program-oriented advisory committees on similarly periodic bases. The common thread for all advisors serving on boards is a commitment to University of Vermont and its high quality research and Extension education. Leaders from throughout the Vermont community regularly and generously offer advice and guidance to University of Vermont Extension and the Vermont Agricultural Experiment Station.

- **Stakeholder Input Mechanisms for National Goal Area 1**

The most structured mechanism for receiving advisory support toward programs focusing on agricultural competitiveness is through University of Vermont Extension Advisory Councils. Advisory Councils are structured to solicit input from a broad array of interest groups. Agricultural representation includes conventional farmers, organic farmers, agribusiness professionals, and representatives of organizations and agencies. Each of the four regions has Advisory Councils with agricultural representation. The Councils meet approximately six times per year and provide input through Regional Chairs. Similarly, the State Advisory Council provides input on statewide issues. Specific program areas receive input from additional advisory boards. The Agricultural Business Management program has an advisory group that is composed of a banker, dairy producers, non-livestock producers, FSA employees, and representatives of industry. This board provides input relative to the structure and content of

Agricultural Business Management workshops conducted throughout the state. Similarly, formal input is solicited on an annual basis from the Internal Revenue Service, the Vermont Tax Commissioner, and private tax accountants relative to the design of curricula for tax management workshops. The Rural and Farm Family Vocational Rehabilitation Program has active citizen advisory groups in the Northeast and Northwest Regions. These groups provide valuable input and provide a support network for disabled farmers and rural residents. Vocational Councilors receive input on program delivery and strive to address the needs of clientele.

Individual faculty and staff targeting programs toward agricultural enterprises work closely with commodity organizations on both a formal and informal basis. Extension professionals serve on committees in many of these organizations and frequently act as technical advisors. Input flows from commodity groups on both a formal and informal basis. Because of the size of the state, there is a general awareness among commodity organization about effective input channels. "Discussion Groups" are conducted throughout the state on various commodity-based topics. These groups meet on a regular schedule to discuss issues affecting their sectors. University of Vermont Extension faculty serve as facilitators for these groups.

Other Vermont agencies having an interest in the agricultural sector are also consulted. A close working relationship exists between Extension and the Vermont Department of Agriculture. Many cooperative programs exist, and ideas are routinely exchanged via individual visits, telephone conversations and electronic mail. Extension professionals also readily interact with USDA FSA and NRCS personnel on both formal and informal bases. Similarly, Extension professionals maintain working relationships with personnel in local conservation districts.

Because of the small size and populations of many New England states, multi-state interaction is a necessity for effective programming. Expertise is readily exchanged across state lines. Formal interaction is facilitated through regular meetings among agricultural program leaders. In 2001, an agricultural directory was developed listing expertise of Extension professionals in Vermont, New Hampshire and Maine. Faculty and staff participate in numerous multi-state programs and maintain functional informal relationships with counterparts in other states.

- **Stakeholder Input Mechanisms for National Goal Area 2 and 3**

Many stakeholder groups provided input about programming related to the goals of providing safe and secure food sources, and healthy and well-nourished populations, they were many: University of Vermont faculty from the department of Nutrition and Food Science, University of Vermont Food Science Center, University of Vermont Sustainable Agriculture Center, University of Vermont Extension Nutrition, Food Safety and Health Curriculum Team Advisory Group, Vermont Food Safety Network, Vermont Food Bank, Northeast Organic Farmers Association, Education and Training Council, Vermont Department of Health, Vermont Department of Education, Department of Agriculture, Food and Markets, Vermont Department of Agriculture, Vermont Department of Aging and Disabilities, Southwest Council on Aging, Vermont Restaurant Assoc., Vermont Manufacturing Extension Center, AARP, Vermont Campaign to End Childhood Hunger, Serve New England, Vermont Department of Employment and Training, Head Start, Community Action Agencies, Farmer's Market Association, Vermont Specialty Food Association, Vermont Fruit and Berry Association, Conference on Food Protection, childcare providers, food service managers and food producers.

To maintain an engaged stakeholder population University of Vermont Extension faculty initiate and sustain regular communications, and involve stakeholders in programming and impact analysis. University of Vermont Extension personnel use both formal and informal approaches to engage stakeholders. The formal approach includes group process, focus group interviews, and retreats. For example, to create our mission statement, goals and objectives the following "group process" steps were taken with the advisory group over a period of five years. In 1995, a nomination and invitation process formed an advisory group representative of our consumers and collaborators. The group attended an initial planning meeting on April 3, 1995. Members were mailed a resource packet that included a survey asking for input about their special interests related to nutrition, food safety, food security, and health and what issues they hoped to see at the forefront of research and educational programs. Using the results of the survey as a starting point, a nominal group process was used to determine what the program foci would be. Three priority areas were selected as our target for programming: Food Safety, Food Security and Practical Education Nutrition and Food Preparation information. Three sub committees made up of faculty and advisory members were formed to develop specific program objectives, action plans and evaluation strategies. In 1996 the advisory group and University of Vermont Extension personnel met again to review the results of the sub-committees work and to finalize mission statement, goals and objectives for the 1996-99 Plan of Work. University of Vermont Extension members met with their advisory sub-groups each year since then, for a program review and impact analysis. Recommendations were recorded and put forth for the following years planning. In February 1999, the advisory group met with faculty and staff to review accomplishments for the program period of 1996-99 and to take part in a group process to formulate goals and objectives for FY2000 to 2004. A decision was made to keep on course, maintaining our mission statement, goals and objectives. It was also decided to evaluate the plan on an annual basis to impact making changes where necessary. The advisory group and team met in September of 2000 to review past performance and current goals and objectives. It was determined at that time to allocate resources to diabetes education and to enhance our efforts to reach Vermont's senior citizens with nutrition and food safety information. Food stamp monies will help to offset the costs of these new initiatives.

With regard to food safety issues, University of Vermont Extension food safety specialists have worked with another formal advisory group, the Vermont Food Safety Network. The network has a membership of over sixty people representing educators, food producers, regulators, and others who are interested in promoting food safety in Vermont. The Vermont Food Safety Network has, through group process, prioritized food safety issues for the state. Top priorities included: education and training; the need for certification standards regulation, and statewide strategies for the food industry; and leadership in food safety for all groups and parties.

Informal contact with stakeholders regarding food safety, food security, and nutrition programs take place daily as University of Vermont Extension personnel work with members of their communities to plan and implement their programs. It is University of Vermont Extension's goal to continue to address issues specific to Vermont, enhancing the quality and impact of these program efforts by engaging in collaborations with land grant institutions across the nation, with the research and teaching faculty at University of Vermont and with other Vermont agencies and institutions.

- **Stakeholder Input Mechanisms for National Goal Area 4**

Four major groups are consulted to obtain input on programs designed to increase harmony between agriculture and the environment: landowners in control of natural resources management; users of Vermont's natural resources; organizations interested in natural resource management; and individuals interested in natural resources management. Information on programming to meet the needs of these stakeholders comes from a variety of means. These include using surveys, personal discussions, memberships on boards and committees, and including a wide range of representatives on Extension boards and councils.

Input that was received included the need to address the economic basis of natural resources management within Vermont and balance this use against the desire to maintain a sustainable resource that meets the needs of a diverse population. There is a desire among youths to know more about their role in maintaining a sustainable environment and community while developing a sense of place.

- **Stakeholder Input Mechanisms for National Goal Area 5**

Community and Economic Development initiatives benefit from the input of a 10 member advisory council representing a variety of agencies and organizations as well as community volunteers. These people have varied backgrounds and bring diverse perspectives to discussions and decision-making. The advisory council meets twice a year, receives informational mailings & telephone calls, and additionally, using e-mail technology, participates on a Community and Economic Development listserv. Annually, members provide advice related to programs during our planning period and help to set priorities for the team. The most recent advisors' assessment was in April 2001, when they ranked each of the potential programs based on their experience and sense of community need.

- **Stakeholder use in developing resource-effective programs**

Extension advisors and other Vermonters help guide Extension programs in agriculture, natural resources and environmental management, nutrition, food safety, and health, and family and community resources and economic development. The following are just some examples of programs developed in consultation with a network of University of Vermont Extension faculty and staff and advisors--including clients, commodity groups, and other Extension, Experiment Station, or University colleagues--to help determine the best use of limited resources, the most effective way to deliver a program, and opportunities for creating partnerships.

Working closely with University of Vermont's Proctor Maple Research Center, Extension and VT-AES faculty and staff respond to the needs of Vermont's twelve county sugar maple associations and sugar makers in general. University of Vermont Extension is the only comprehensive educational and informational resource available for both commercial and small, family-based maple sugar operations. Vermont sugar makers have recommended and guided the design of an educational series on small-scale maple sugaring and have contributed critical financial resources to support the work of University of Vermont's Entomology Laboratory. Results of a survey of local food shelves and community kitchens conducted by the Vermont Food bank has been used by University of Vermont Extension to determine what types of nutrition and food safety workshops should be conducted to help Vermonters with limited resources.

University of Vermont Extension is an important leader among the vast number of individuals and organizations throughout the state working to support the positive development of Vermont youth. More than 1,500 volunteers invest numerous hours and incredible talent to 4-H camps and clubs and other youth-related program efforts. The program Expanding the Caring Community, was guided by more than 300 advisors and partners as it successfully carried out educational and recreational activities for at-risk youths in five Vermont communities.

C. Program Review Process

A comprehensive system of state, regional, and curriculum advisors has contributed greatly to the ongoing, informal review of University of Vermont Extension programming. In response to AREERA, a more formal merit review of outreach activities was conducted in May 1999. Two reviewers from each of UVM Extension's four curriculum/program teams' advisory groups were selected to systematically review all proposed curricula. Reviewers were asked to rate each curriculum plan according to the following criteria:

- Impact – programs have the potential to produce a measurable, positive impact on Vermonters
- Resource availability/accessibility—the plan identifies the necessary resources (people, dollars, curricula) to implement programs successfully.
- Reaching diverse audiences—potential for programs to meet the needs of diverse, underserved audiences.
- Customer demand—programs are linked to clearly articulated customer needs.
- Collaboration—potential exists for collaboration between Extension and research, with other UVM Departments, or with other institutions.
- Innovation—programs are unique, are not being done, or are not done well by others.

Members of the 1999 Review Team for the Plan of Work 2000-2004 included:

- Liz Slayton, Vermont Senator Patrick Leahy's Office
- Sue Clark, Vermont Department of Education
- Phil Benedict, Vermont Department of Agriculture, Food & Markets
- Enid Wonnacott, Northeast Organic Farmers Association
- Ed Larson, Vermont Wood Products Industry
- Ann Street, Vermont Department of Education—Family & Consumer Sciences/Human Services Division
- Bill Jewell, Landscape Architect, Vermont Act 250 Coordinator
- Claire Ayer, Vermont Association of Conservation Districts

Results of the merit review process are shared with members of the UVM Extension program management team that includes the chairs of on campus and regional units and the curriculum/program teams.

Extension representatives continue to meet with a State Advisory Council four times per year to evaluate the merit of past, current and future programming foci. Current members of the State Advisory Board represent nine different counties in Vermont:

Anne Allen
Ray Allen

Roland Burroughs
Austin Cleaves
Michael Farmer
Ed Gale
Bill Jewell
Edward Larson
Liz Slayton
Jill Tarule
John Titchner
Barbara Woods

D. Evaluation of the Success of Multi and Joint Activities

- **Multi-Institutional and Interdisciplinary Activities**

Many University of Vermont faculty and staff are increasing their collaborative efforts with researchers and other colleagues from other states and institutions.

University of Vermont Extension agricultural specialists are working closely with the University of New Hampshire to improve water quality in the Connecticut River Valley. The Integrated Crop Management project has led to strong commitment on the part of ten participating communities along either side of the river (and therefore in different states). By-laws of the newly formed bi-state organization have been developed and implemented. Impact on policies, programs, or behaviors affecting the Connecticut River Valley watershed has yet to be determined. Additional efforts in the area of water quality improvement include a nutrient management planning and education program targeting dairy farmers in Vermont, New York, Pennsylvania, and New Hampshire. Colleagues have joined forces to advance research, which has led to recommendations for farmers about the most cost effective ways to reduce phosphorus loading in waterways leading from their fields. Reducing the phosphorus content in feed, creating buffers, and receiving advice from consultants, provides dairy farmers with a cost-effective mechanism for maintaining water quality as herd size grows.

An excellent example of University of Vermont researchers working with other states is the bovine mastitis project. VT-AES researchers are active participants in a study of mastitis-resistant animals involving colleagues from 13 states as well as Canada and England. This work has led to scientific breakthroughs that could significantly improve animal health and welfare and potentially save the dairy industry millions of dollars. A mastitis-resistant mouse has been developed, and results of this work are being transferred to improve mastitis resistance in dairy cows.

University of Vermont Apple Team researchers and Extension faculty are continuing long-term collaborations with Cornell University to develop and field test new apple cultivars that will eventually improve the hardiness and quality of Vermont's apple crop. Two cultivars have been developed that have been identified as appropriate for Vermont climate and orchard conditions. These cultivars have been planted commercially throughout the state, although data about impact on apple growing profits related to the use of these cultivars remains outstanding. Additional research for this project yielded data suggesting a dwarf series rootstock performs more efficiently than other series for apple tree growth and production.

The Watershed Alliance project focuses on education and outreach related to watershed and coastal water quality around the Lake Champlain Basin. The project is supported by USDA, University of Vermont School of Natural Resources, and Lake Champlain Sea Grant dollars. While University of Vermont Extension is focused on watershed management and stewardship, colleagues at State University of New York -- Plattsburg offer expertise in fisheries for the bi-state Lake Champlain Sea Grant program. The efforts have created youth-led actions resulting in safer water for communities.

The establishment of the joint University of Vermont—Cornell University Northeast Center for Food Entrepreneurship (NECFE) through the successful proposal award of \$3.8 million by USDA Fund for Rural America, has produced a synergy among researchers and outreach personnel for food manufacturing start-up and small businesses. NECFE has assisted in analyzing more than 400 products for safety and marketing feasibility. The center has also helped entrepreneurs to expand sales beyond state lines – to other regions, and internationally. NECFE is a growing organization, creating a large, northeast cooperative for food manufacturing entrepreneurs.

University of Vermont Extension food safety specialists are working with faculty from New England, New York, Wisconsin, and West Virginia on food safety programs that emphasize reducing microbial contamination on produce. Food safety curricula have been developed, used to train instructors, and disseminated throughout the country, based on the combined efforts of University of Vermont Extension, University of Rhode Island, University of Connecticut, and the University of New Hampshire. Food certification of school food service workers translates into safer school food for our children, who are most at risk of food-borne illnesses. Vermont has certified 23 food service workers, making them eligible for promotion and pay raises, as well.

In cooperation with colleagues throughout New England, University of Vermont research and Extension specialists continue to deliver cutting edge research and educational information to aid greenhouse growers in adopting safer integrated pest management strategies.

- **Multi-State Activities**

As part of the national land grant system, University of Vermont Extension and Agricultural Experiment Station are involved in a variety of multi-state outreach and research activities that address the five national goal areas.

University of Vermont Extension agricultural specialists are working closely with colleagues from New Hampshire to improve water quality in the Connecticut River Valley. The Integrated Crop Management project has led to strong commitment on the part of ten participating communities along either side of the river (and therefore in different states). By-laws of the newly formed bi-state organization have been developed and implemented. Impact on policies, programs, or behaviors affecting the Connecticut River Valley watershed has yet to be determined. Additional efforts in the area of water quality improvement include a nutrient management planning and education program targeting dairy farmers in Vermont, New York, Pennsylvania, and New Hampshire. Colleagues have joined forces to advance research, which has led to recommendations for farmers about the most cost effective ways to reduce phosphorus loading in waterways leading from their fields. Reducing the phosphorus content in feed,

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- **Integrated Activities**

An effective method of integrating research and Extension activities at the University of Vermont is through the split appointment of faculty. At present there is faculty with split appointments in the following departments: Animal Sciences; Community Development & Applied Economics; Plant & Soil Science; and Nutrition & Food Science. In addition to teaching and research, faculty members are assigned to Extension curriculum/program teams and play active roles in developing and implementing outreach programs.

In the area of agriculture, Vermont has developed an integrated orchard management approach in which horticultural and pest management aspects have been interwoven in Extension and research activities. The University of Vermont Vermont Apple Program emphasizes a team approach. The team includes a pomologist, an IPM specialist, qualified technical personnel, and graduate and undergraduate students. The program features one-on-one interactions with apple growers, orchard demonstrations, meetings, workshops, publications, active research in commercial orchards, and development of Internet web sites for education and information delivery. The University of Vermont Apple Team provides the scientific and technical expertise necessary to help apple growers remain competitive in local, national and international markets while maintaining a sustainable agricultural system.

To encourage greater collaboration and integration between University of Vermont research and Extension faculty, a pool of targeted funds has been developed to support a competitive grant proposal process—The Vermont Integrated Research and Extension Award (VIRECA). Research proposals are merit and peer reviewed by a panel consisting of research and Extension faculty as well as stakeholders representing research and Extension constituencies. Eligible research proposals must be clearly linked to at least one the five national goal areas and priority areas identified by our advisors and stakeholders. These priorities include:

- Food Safety
- Food Security--increasing local consumption of Vermont grown foods
- Rural Communities--the Working Landscape and Workforce Development
- Water Quality--reducing non-point source pollution, alternative nutrient management and feeding management strategies

Advisors helped to review proposals and the program funded two three-year projects in FY2000. One project is dedicated to the examination of the cold-hardiness of the western flower thrips, a common greenhouse pest. The research has gleaned useful information regarding the cold-hardiness of the western flower thrips, but outreach efforts have yet to take place. The second project explores the use of touch-screen computer technology in the delivery of health and nutrition information to senior citizens. Similarly, development of the instrument and information has been completed, and pilot tests have shown the potential effectiveness of having the screens in doctor's offices and nursing homes. The coming year will provide the first data regarding the impact of the screens on eating behaviors for senior citizens.

A second round of three-year awards, including more strictly defined guidelines, offered no new awards, due to the quality of proposals received. Although quality research and outreach efforts were described in many entries, the committee is determined to ensure collaboration is clearly defined. This year, a pre-proposal review process is expected to increase the quality of integration described in the proposals, and funds are expected to be awarded for two to three projects.